

## MEMORANDUM

TO: KAREN BLACK, P.E.  
BRIAN DUNEVANT, P.E.

FROM: JESSICA DIMMICK, P.E., AICP  
BILL WUENSCH, P.E., PTOE

ORGANIZATION: CITY OF DANVILLE

DATE: OCTOBER 30, 2019

RE: FINAL WESTOVER DRIVE ROAD DIET FEASIBILITY ASSESSMENT

☐ URGENT ☒ FOR YOUR USE ☐ PLEASE COMMENT ☐ PLEASE REPLY ☐ PLEASE RECYCLE

## 1. Project Overview and Summary

Westover Drive (State Route 51) in the City of Danville, VA is an east-west road linking the US 58 (Martinsville Highway/ Danville Expressway) interchange with US 311 (Berry Hill Road) at the western city edge to the regional retail area with the Riverside Shopping Center and other businesses along Riverside Drive between Piedmont Drive and Central Boulevard. Westover Drive runs parallel to Riverside Drive (US 58 Business), a median-separated 55 mph principal arterial carrying roughly 13,000 vehicles per day.<sup>1</sup> In contrast, Westover Drive carries between 2,200 and 8,100 vehicles per day, providing access to a few small commercial establishments and residences located along and just off of Westover Drive.<sup>2</sup>

The roughly two-mile eastern portion of Westover Drive from the regional retail area to Capri Court/ Wade Street (Charlie's Stop & Shop and Buxton's Westover Garage) is a 35 mph facility with on-street bicycle lanes and two vehicle travel lanes (one lane in each direction). The roughly four-mile western portion of Westover Drive from Capri Court/ Wade Street to the US 58 & US 311 interchange has a 40 mph posted speed limit with four vehicle travel lanes and shared lane markings (sharrows) in the curbside lanes.

As a lower speed, lower volume parallel facility to Riverside Drive, Westover Drive has potential to serve a more multimodal function, providing a key east-west connection for pedestrians and bicyclists. The City of Danville is exploring options to create a more multimodal environment along Westover Drive, including potentially reconfiguring the four-lane portion to more closely match the eastern section with two vehicle travel lanes (one in each direction) and on-street bicycle lanes.

EPR, P.C. conducted a feasibility study to examine options for reconfiguring the current four-lane configuration to provide higher quality facilities for non-auto modes, focusing on bicycle facilities.

<sup>1</sup> VDOT 2017 Average Annual Daily Traffic Counts: 13,000 AADT for Riverside Drive (Bus US 58) between WCL Danville; SR 51 Westover Dr and Bus US 29 Park Ave

<sup>2</sup> Source: VDOT 2017 AADT Data. See **Figure 6** for more detailed traffic count data along Westover Drive.

Based on an examination of relevant safety and operational data, EPR, P.C. developed several configurations for consideration:

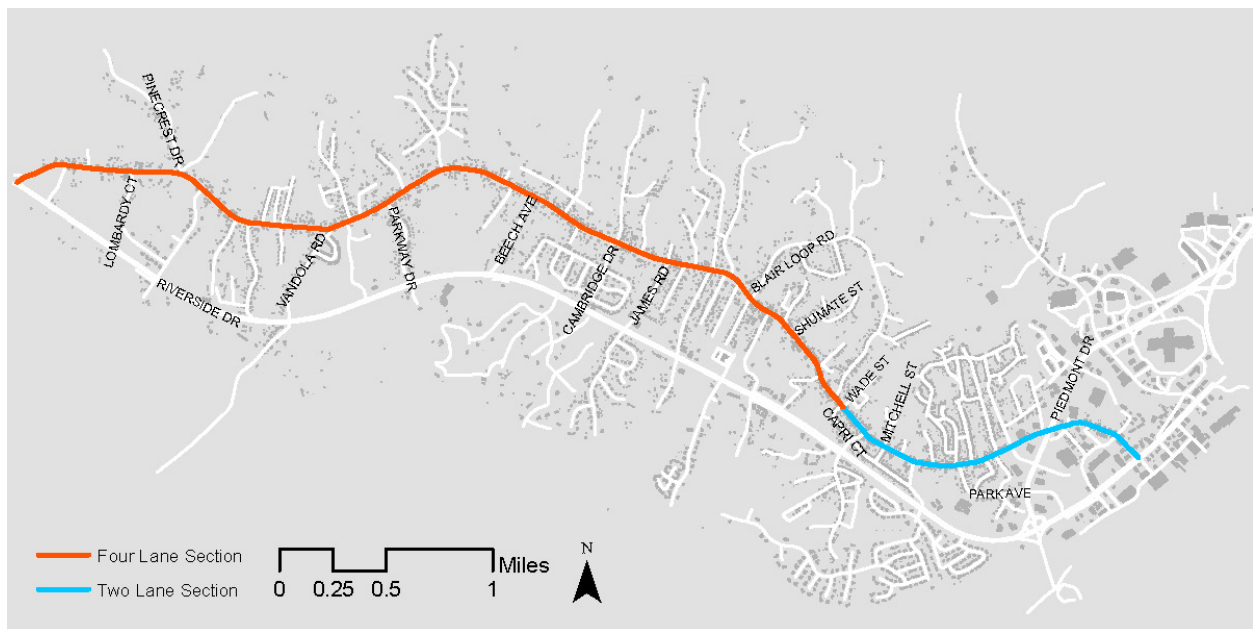
- Option 1: On-Street Buffered Bicycle Lanes
- Option 2: Cycle Track
- Option 3: Continuous Two-Way Left-Turn Lane

All of the configurations reduce the number of vehicle travel lanes from four to two. The analysis of traffic volumes indicates that a two-lane typical section can accommodate the current traffic volumes while providing safety benefits and improving the environment for non-motorized users.

**Ultimately, EPR, P.C. recommends Option 1: On-Street Buffered Bicycle Lanes.** This option provides a dedicated lane for bicyclists on both sides of the road with a painted buffer space between the travel lane and bicycle lane and provides the best use of space for both bicyclists and vehicles. It does not require changes in driveway access and does not pose as many maintenance challenges as the cycle track option.

## 2. Introduction and Context

**Figure 1** shows the extents of Westover Drive including the eastern two-lane section from Riverside Drive to Capri Court/ Wade Street and the western four-lane section from Capri Court/ Wade Street to the US 58 (Martinsville Highway) interchange.



*Figure 1: Westover Drive Context Map*

### a. Adjacent Land Use

The existing land uses adjacent to the corridor are primarily residential with a few neighborhood-scale commercial uses. East of Park Avenue, the land uses transition to a mix of larger commercial establishments (Food Lion grocery store, US Postal Service, and Danville Toyota car dealership) and a few existing single-family homes. The future land use designations in the City's comprehensive plan

retain the residential uses in the western portion and designate the portion east of Park Avenue as Regional Commercial.

### **b. Bicycle Connectivity**

Westover Drive is a part of the proposed statewide Beaches to Bluegrass Trail to connect communities between the Virginia Beach oceanfront and Cumberland Gap. In 2015, the Virginia Department of Conservation and Recreation and VDOT developed the Beaches to Bluegrass Trail Master Plan, which shows Westover Drive as a section of the on-road interim route connecting the Dan River corridor to the abandoned Dick and Willie Passage corridor to Martinsville. The trail master plan recommends developing a detailed corridor study to identify an off-road path/trail opportunity through the area. The 2018 West Piedmont Regional Bicycle Plan emphasizes the Beaches to Bluegrass Priority Corridor as one of three priority areas to identify safer routes with relatively low traffic volumes to encourage bicyclists to ride.

The Transportation System map in the City's comprehensive plan shows a "Bike Lane/Trail" along Westover Drive, and the Trail Master Plan Extension map includes the same designation for Westover Drive. These maps demonstrate consistency in the City's desires for Westover Drive to serve as a key east-west connection for non-auto modes. However, the bicycle facility in the western portion is a faded shared lane marking and Share the Road signs. There is no exclusive dedicated facility for bicyclists west of Capri Court/ Wade Street.

### **c. Transit Routes**

Danville Transit routes #2 Riverside and #5 Riverside traverse the eastern portion of Westover Drive between Park Avenue to Riverside Drive providing transit access to the commercial establishments. Transit headways are 60 minutes and longer.

### **d. Functional Classification**

VDOT classifies Westover Drive as an urban minor arterial. Urban minor arterials place more emphasis on land access, serve trips of moderate length at a somewhat lower level of travel mobility than principal arterials, and distribute traffic to smaller geographic areas.<sup>3</sup>

VDOT considers a variety of factors when determining functional classification including existing and anticipated traffic volumes, trip types, system connectivity, and FHWA-established mileage percentage thresholds. Functional classification influences but does not dictate the design of the typical section and posted speed limit. The typical section design depends on the roadway and traffic characteristics, context of the surrounding land uses, and community desires.

### **e. Ideal Bicycle Accommodations**

The existing 40 mph four-lane typical section of Westover Drive with shared lane markings is inconsistent with current AASHTO guidance for bicycle facilities. Shared lane markings are most appropriate for facilities that have a maximum speed limit of 25 mph and a maximum volume of 3,000

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<sup>3</sup> VDOT (2014). *Functional Classification Comprehensive Guide*.  
[http://www.virginiadot.org/Functional\\_Classification\\_Comprehensive\\_Guide.pdf](http://www.virginiadot.org/Functional_Classification_Comprehensive_Guide.pdf)

vehicles per day.<sup>4</sup> Virginia law requires drivers to pass bicyclists with at least three feet of space between the vehicle and the bicyclist,<sup>5</sup> and VDOT recommends 14 feet of usable lane width for shared use in a wide outside lane.<sup>6</sup>

On-street bicycle lanes (preferably with a buffer) are appropriate for roads with 3,000 to 6,000 vehicles per day and speeds between 25 and 30 mph. The recommended treatment for roads with volumes above 6,000 vehicles per day or speeds above 30 mph is a separated bike lane or shared-use path.<sup>7</sup>

With this guidance in mind, EPR, P.C. examined data and developed options for bringing the bicycle facilities along Westover Drive closer to the ideal recommended facilities, as explained in the following sections.

### 3. Data Collection and Analysis

EPR, P.C. gathered geometric, operational, and safety data from the following sources:

- City of Danville
  - 2015 aerial imagery and GIS shapefiles of parcels adjacent to the right-of-way
  - AutoCAD drawing with curb-to-curb cross-section and right-of-way measurements
  - 48-hour traffic volume counts and speeds at five locations (see *Attachment A*)
  - AM and PM peak hour turning movement counts at six intersections (see *Attachments B and C*)
- VDOT
  - 5-year Crash data (see *Attachment D*)
  - 2017 Average Annual Daily Traffic volumes (for additional context)
  - Top 100 Intersections and Top 100 Miles of Segments with Potential for Safety Improvements in the VDOT Lynchburg District

#### a. Site Visit Observations

EPR, P.C. conducted a site visit in September 2018 to confirm cross-section measurements, identify critical issues with sight distance, grades, or other geometric, operational, and safety conditions. EPR, P.C. noted the following observations:

- Throughout the corridor, the face-of-curb to face-of-curb measurement is 40 feet consistently, with 36 feet of asphalt pavement between 2-foot gutter pans on each side. Lane widths consistently measured 9-feet wide (not including the gutter pan for the curbside lanes). EPR, P.C. confirmed through a general drive-through of the corridor that drivers are consistently driving at speeds higher than the posted speed limit.

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<sup>4</sup> AASHTO (2012). *Guide for the Development of Bicycle Facilities, Fourth Edition*. Washington, DC.

<sup>5</sup> Code of Virginia §46.2-839.

<sup>6</sup> VDOT Road Design Manual, page A(1)-16, "Wide Curb/Outside Lanes"

<sup>7</sup> Bicycle Facility Selection Chart proposed for the Fifth Edition of the AASHTO Guide for the Development of Bicycle Facilities, anticipated to be released in 2018. Fields, J. and Onta, S. (2018). *What to Expect from the 2018 AASHTO Bike Guide*. PowerPoint Presentation to APA Colorado Chapter.

[http://www.tooledesign.com/sites/default/files/2018%20AASHTO%20Bike%20Guide%20Preview\\_Fields\\_Onta\\_small.pdf](http://www.tooledesign.com/sites/default/files/2018%20AASHTO%20Bike%20Guide%20Preview_Fields_Onta_small.pdf)



- Utility poles and other objects (e.g. mailboxes and trash cans) are located very close to curb throughout the corridor, some within four feet of the face-of-curb. There are a number of fixed object crashes in the western four-lane section, and the westbound 85<sup>th</sup> percentile operating speeds are over 10 mph over the posted speed limit. The four-lane configuration with narrow lanes, presence of fixed objects close to the curb, and high vehicle speeds are likely contributors to high fixed object crash rates.
- In general, the horizontal and vertical alignment consists of gentle grades and curves. EPR, P.C. did not identify any glaring site distance issues. The site distance may need to be more closely examined at the Emmanuel Church of the Brethren driveway, where utility poles are located within the sight triangle, as shown in **Figure 2**.
- Vehicles waiting to access the gas pumps at the Quality Plus gas station next to Blair Loop Rd queue back onto Westover Drive (see **Figure 3**). The crash data shows a cluster of angle, rear-end, and head-on collisions at this location. This is also the location of a pedestrian fatality, next to the Dollar General store.
- Cobra head street lights are present consistently throughout the corridor.
- A resident approached the project team and expressed concerns with high vehicle speeds.
- The shared lane markings are faded and difficult to see.



*Figure 2: Site Photo at Emmanuel Church of the Brethren looking to the southeast. Utility poles are located within the sight triangle.*



*Figure 3: Site Photo at Blair Loop Road. Vehicles waiting to access the gas pumps at the Quality Plus gas station queue back into the road, blocking the curbside westbound lane.*

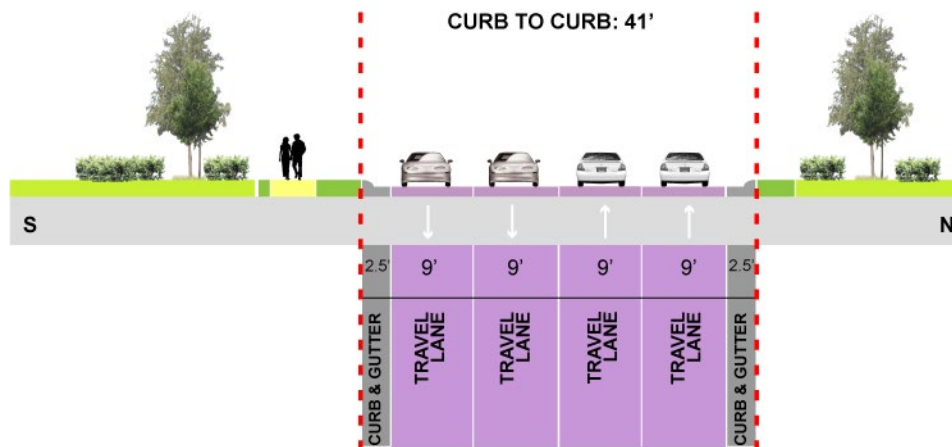




*Figure 4: Site Photo at Blair Loop Road. Shared lane markings are faded and difficult to see throughout the corridor.*

## b. Geometric Measurements

The existing typical section consists of 56 feet of right-of-way, with a 5-foot wide sidewalk and 5-foot wide grass buffer on the south side.<sup>8</sup> The face-of-curb to face-of-curb distance consistently measured 40 feet throughout the entire four-lane section. The 41-foot measurement shown in **Figure 5** includes two feet of gutter pan and six inches of curb in each direction. Within the 36 feet of asphalt pavement, the current configuration consists of two travel lanes in each direction. The inside lane is nine feet wide, and the outside (curbside) lane is nine feet wide (not including the gutter pan).

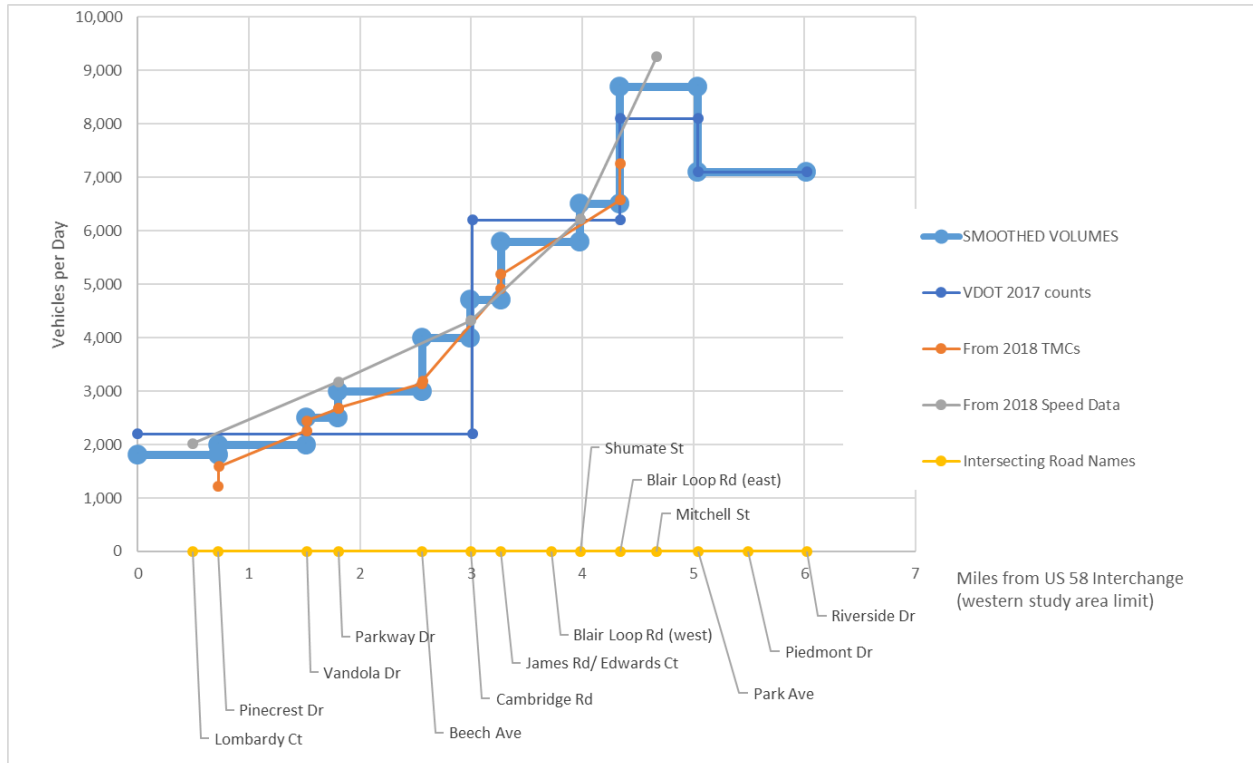


*Figure 5: Existing Typical Section*

<sup>8</sup> EPR, P.C. determined these measurements from the AutoCAD drawing file the City of Danville provided, which showed parcel boundaries. EPR, P.C. measured 56 feet of right-of-way throughout the entire portion of Westover Drive.

### c. Traffic Volumes

EPR, P.C. combined 2017 traffic estimates from VDOT with volume data from the City's turning movement counts and speed data collection efforts and developed smoothed traffic volumes for analytical purposes. **Figure 6** shows the individual traffic data from each source and the smoothed volumes used for analysis.



*Figure 6: Traffic Volumes from Various Data Sources and Smoothed Volumes for Analysis Purposes*

In the western four-lane section, volumes range from less than 2,000 vehicles per day on the western end to roughly 6,500 vehicles per day on the eastern edge at the transition to the two-lane section at Blair Loop Rd (east). Volumes on the eastern two-lane section are much higher, at roughly 8,700 vehicles per day between east of Park Ave and 7,100 vehicles per day west of Park Ave.

### d. Capacity and Level of Service Analysis

Using the information from the turning movement counts and volumes, EPR, P.C. conducted a capacity analysis using the 2010 Highway Capacity Manual methodology for multilane highways. Based on current volumes and roadway geometric characteristics, **Westover Drive is currently operating at Level of Service (LOS) A for automobiles during the peak hours.** Typically, roads are not designed to operate at LOS A during peak periods. These roadways are often good candidates for lane repurposing projects to better utilize right-of-way.

**The current configuration of Westover Drive produces a Bicycle Level of Service D.** Bicycle level of service describes bicyclists' comfort and perceived exposure. Bicycle LOS is a function of vehicle volumes, vehicle speeds, pavement surface condition, and effective width of the outside

through lane (i.e. on-street bicycle lanes and paved shoulders increase this width). The narrow vehicle lanes and high vehicle speeds on Westover Drive are the main contributors to poor bicycle level of service under the existing roadway configuration.

Given the importance of Westover Drive as an east-west connector for bicyclists, the discrepancy between Automobile Level of Service A and Bicycle Level of Service D indicates potential for reconfiguring the roadway to provide a better balance.

It is important to note that level of service is a simplification of complex numerical performance results into an easy-to-understand A through F scale. LOS generally identifies whether facility performance is acceptable and whether the general public will perceive a future change in performance. The concept of LOS has several weaknesses including a step function nature, input variability, and limitations on severity of failing conditions. EPR, P.C. evaluated LOS for automobiles and bicyclists along Westover Drive to obtain a basic understanding of how motorists and bicyclists perceive current operating conditions and to see if the proposed options would significantly improve their perceptions of operating conditions.

#### e. Speeds

Vehicle speeds directly affect the comfort and safety of bicyclists and pedestrians. Bicyclists' and pedestrians' lack of protection make them especially vulnerable to injuries and fatalities from vehicle crashes. The likelihood of pedestrian death from a vehicle crash increases from 5% at a vehicle impact speed of 20 mph, to 45% at 30 mph, and 85% at 40 mph.<sup>9</sup> Vehicles speeds influence level of traffic stress (LTS). Speeds of 30 mph or less correspond with the lowest LTS (1), and speeds of 40 mph or higher with the highest LTS.<sup>10</sup>

The National Transportation Safety Board (NTSB) recommends using a "safe system" approach to setting speed limits that emphasizes likely crash types and human biomechanical tolerances and depends less exclusively on the 85<sup>th</sup> percentile speed, which alone can unintentionally generate a cycle of speed escalation and reduced safety.<sup>11</sup> The NTSB also recommends revising the MUTCD to include crash statistics as a required factor for setting speed limits and eliminating the current guidance that speed limits should be within 5 mph of the 85<sup>th</sup> percentile speed.

The western four-lane portion of Westover Drive has a 40 mph posted speed limit. The speed limit drops to 35 mph in the eastern two-lane portion. As shown in **Table 1**, the 85<sup>th</sup> percentile speeds indicate most eastbound vehicles are traveling within 5 mph of the posted 40 mph limit at Parkway Drive and further east. Westbound vehicles are traveling nearly 10 mph above the 40 mph speed limit at the point where the typical section changes from two to four lanes (between Mitchell St and Shumate St), and increase speeds as they continue west. At Lombardy Court, the 85<sup>th</sup> percentile speeds

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<sup>9</sup> European Transport Safety Council (1995). Reducing Traffic Injuries Resulting from Excess and Inappropriate Speed. Brussels, Belgium.

<sup>10</sup> *LTS Criteria for Bike Lanes Not Alongside a Parking Lane* from Mekuria, M.C., Furth, P.G., and Nixon, H (2012). Low Stress Bicycling and Network Connectivity. Mineta Transportation Institute. <http://transweb.sjsu.edu/sites/default/files/1005-low-stress-bicycling-network-connectivity.pdf>.

<sup>11</sup> NTSB (2017). Reducing Speeding-Related Crashes Involving Passenger Vehicles. Safety Study NTSB/SS-17-01. Washington, DC.

reach nearly 15 mph above the posted 40 mph speed limit. The average (50<sup>th</sup> percentile) speeds at Lombardy Court are 47 mph in both directions. *Attachment A* provides more detailed speed data.

Table 1: 85<sup>th</sup> Percentile Spot Speeds (miles per hour)

	Lombardy Ct	Parkway Dr	Cambridge Rd	Shumate St	Mitchell St
<i>Posted Speed Limit</i>	40	40	40	40	35
Westbound	54	51	49	48	43
Eastbound	54	44	44	42	41

During the site visit, a Westover Drive resident spoke with the EPR, P.C. team and expressed concern about high vehicle speeds and a desire for traffic to slow down. Riverside Drive (US 58) parallels Westover Drive to the south and has a posted speed of 55 mph with wider lanes and median separation. Riverside Drive provides mobility for high-speed east-west trips. As a parallel corridor, Westover Drive can provide a safe and comfortable environment for bicycles and pedestrians.

The key to providing a safe and comfortable environment for bicyclists and pedestrians is to reduce vehicle speeds to below 40 mph at a maximum, and preferably below 30 mph, as indicated by research on pedestrian and bicyclist fatalities and in the latest industry-accepted guidance as previously cited. The VDOT Road Design Manual allows a broad range of the design speed for urban minor arterials from 30 to 60 miles per hour, depending on context. The DRPT Multimodal System Design Guidelines, which are consistent with the VDOT Road Design Manual and the Designing Walkable Urban Thoroughfares Guidebook from the Institute of Transportation Engineers and the Congress for New Urbanism, recommend Multimodal Boulevards have a design speed of 30 to 35 mph.

#### f. Safety Analysis

EPR, P.C. obtained crash data from January 1, 2013 through December 31, 2017 from the VDOT Tableau Crash Tool. In accordance with the 2010 Highway Safety Manual (HSM), EPR, P.C. conducted a safety analysis of the Westover Drive corridor using the predictive method for urban and suburban arterials. This method computes the *predicted average crash frequency* based on current roadway characteristics and current traffic volumes and the *expected average crash frequency* that accounts for actual observed crash statistics.

**Table 2** presents the results of the safety analysis of the existing four-lane roadway configuration and accounting for the five years of available crash data. Note: the crash frequencies do not sum exactly due to rounding.

The predicted average crash frequency for the four-mile long four-lane portion of Westover Drive is 8.6 crashes per year, based on current roadway characteristics and current traffic volumes. The expected average crash frequency, which accounts for the historical crash data, is slightly higher at 9.4 crashes per year.



Table 2: Existing Conditions Safety Analysis – Predicted and Expected Crash Comparison

Segment/Intersection	Historical Crash Data (2013-2017 average crashes/year)			Predicted Crash Frequency (crashes/year)			Expected Crash Frequency (crashes/year)		
	Fatality/Injury	Property Damage Only	Total	Fatality/Injury	Property Damage Only	Total	Fatality/Injury	Property Damage Only	Total
Westover Dr from US 58 to Pinecrest Dr	0.6	0.6	1.2	0.2	0.3	0.4	0.3	0.4	0.5
Westover Dr from Pinecrest Dr to Vandola Rd	0.8	0.4	1.2	0.2	0.3	0.5	0.2	0.4	0.6
Westover Dr from Vandola Rd to Parkway Dr	0.4	0.0	0.4	0.1	0.1	0.2	0.1	0.1	0.2
Westover Dr from Parkway Dr to Beech Ave	1.2	0.6	1.8	0.3	0.5	0.7	0.4	0.6	0.9
Westover Dr from Beech Ave to Cambridge Rd	0.2	0.6	0.8	0.2	0.4	0.6	0.2	0.5	0.7
Westover Dr from Cambridge Rd to James Rd/ Edwards Ct	0.4	0.2	0.6	0.2	0.3	0.5	0.2	0.3	0.5
Westover Dr from James Rd/ Edwards Ct to Shumate St	0.8	1.8	2.6	0.7	1.3	1.9	0.8	1.4	2.1
Westover Dr from Shumate St to Blair Loop Rd (east)	1.4	0.8	2.2	0.4	0.7	1.1	0.4	0.8	1.2
Westover Dr at Pinecrest Dr	0.2	0.0	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Westover Dr at Vandola Rd	0.0	0.2	0.2	0.2	0.3	0.5	0.2	0.3	0.5
Westover Dr at Parkway Dr	0.0	0.0	0.0	0.1	0.1	0.2	0.1	0.1	0.1
Westover Dr at Beeche Ave	0.0	0.0	0.0	0.1	0.1	0.2	0.1	0.1	0.2
Westover Dr at James Rd/ Edwards Ct	0.2	0.2	0.4	0.3	0.6	0.9	0.3	0.5	0.8
Westover Dr at Blair Loop Rd (east)	0.6	0.8	1.4	0.3	0.5	0.8	0.4	0.6	1
ALL SITES	6.8	6.2	13.0	3.4	5.6	8.6	3.8	6.2	9.4

Per the 2010 HSM, short-term crash frequencies alone are not a reliable estimator of long-term crash frequency for many reasons including:

- Natural fluctuations and regression-to-the-mean bias in crash frequencies because crashes are rare and random events
- Observed crash data can have data quality issues because there are limitations to recording, reporting, and measuring crash data with accuracy and consistency

Between 2013 and 2017, an average of 13 crashes occurred in the four-lane portion of Westover Drive per year. However, it is likely that this is a period of high crash frequency, and it is statistically probable that it will be followed by a period of comparably low crash frequency. For the reasons above, the safety analysis focuses on comparing the predicted crash frequency to the expected crash frequency, not the historical crash data.

The expected crash frequency is slightly higher than the predicted crash frequency for most segments, only by 0.1 or 0.2 crashes per year. Only one intersection - Westover Dr at Blair Loop Rd (east) – has an expected crash frequency higher than the predicted crash frequency. The analysis indicates there is potential for safety improvements within the corridor segments and at this one intersection, but it is a relatively small potential compared to other areas, as explained in the next few paragraphs.

### VDOT POTENTIAL FOR SAFETY IMPROVEMENT LOCATIONS

VDOT identifies locations that have potential for safety improvements (PSI) by combining predicted crashes with actual observed crash histories to produce expected crash frequencies. Locations where the expected crash frequency (which combines the predicted and observed frequencies) is higher than the predicted frequency (which is based on traffic volumes and roadway characteristics) have potential for safety improvements. VDOT publishes the top 100 intersections and top 100 miles of roadway segments in each VDOT district that have the greatest potential for safety improvement.

Nine segments along Westover Drive are included in the top 100 miles of roadway segments with the greatest potential for safety improvements in the VDOT Lynchburg District, based on crash data from 2013 to 2017. These segments are identified in **Figure 7**. None of the top 100 intersections with the greatest potential for safety improvements are located along Westover Drive.



*Figure 7: Westover Drive Segments within the Top 100 Miles with the Greatest Potential for Safety Improvements in the VDOT Lynchburg District, incorporating 2013-2017 crash data. Data Source: VDOT Highway Safety Analysis Mapping.*

Five of the nine segments are located in the western four-lane section west of Capri Ct/ Wade St. Four of the nine segments are in the eastern two-lane section. **Table 3** shows the ranking of each identified Westover Drive segment relative to the 494 segments identified in the VDOT Lynchburg District, and identifies segments identified as Target Safety Needs.

*Table 3: Westover Drive PSI Segment Rankings. Data Source: VDOT Highway Safety Analysis Mapping.*

Segment ID	Length (miles)	Rank by Total Crash PSI*	Target Safety Need**	Roadway Section
1	0.40	199	NO	West (4-Lane)
2	0.20	312	YES	West (4-Lane)
3	0.26	375	NO	West (4-Lane)
4	0.08	378	NO	West (4-Lane)
5	0.11	387	NO	West (4-Lane)
6	0.47	74	YES	East (2-Lane)
7	0.20	292	YES	East (2-Lane)
8	0.31	58	YES	East (2-Lane)
9	0.47	151	YES	East (2-Lane)

\*There are 494 segments in the Top 100 Miles with the Greatest PSI in the VDOT Lynchburg District.

\*\*Segments with high total crash PSIs and high fatality and injury crash PSIs for at least consecutive two years are identified as Target Safety Needs and considered for the Highway Safety Improvement Program.

### CRASH TYPES

Angle crashes are the most common crash type in the five PSI segments in the western four-lane section, comprising 29 percent of crashes (seven of 24 crashes total) within these segments. Head-on, sideswipe (same direction), and other<sup>12</sup> crashes are the next most common, comprising 17, 13, and 13 percent, respectively. Angle and head-on crashes together comprise 60 percent of crashes that resulted in injury in these five PSI segments. The high density of driveways may be a contributing factor to crashes in these segments, especially angle crashes.<sup>13</sup>

One fatal crash occurred along Westover Drive between 2013 and 2017 – a distracted driver killed a pedestrian at 6 pm on December 10, 2017 in front of the Dollar General at Blair Loop Rd (east).

Angle and fixed object crashes are common in the four-lane section overall. There is an average of four angle crashes every year and 2.2 fixed object crashes every year. These trends align with the general predicted crash frequencies for these and other related crash types because of the high density of driveways, high density of fixed objects (e.g. utility poles), and close distance between the vehicle lanes and the fixed objects.

Collisions with deer are also common – at least one deer crash occurred in the four-lane section in four of the five years analyzed - and greatly surpass the predicted frequency.

It is important to note EPR did not review individual police crash reports. The findings here are based on possible correlations and are not proven causalities.

### **g. Summary of Findings from Data Collection and Analysis**

Overall, the data collection and analysis revealed Westover Drive has low daily and peak hour volumes for the current four-lane configuration. The Automobile Level of Service A is very high compared to

<sup>12</sup> "Other" crashes do not include rear-end, sideswipe (opposite direction), fixed object, deer, bicyclist, pedestrian, backed into, non-collision, and other animal crash types.

<sup>13</sup> Although FHWA's Crash Modification Factor Clearinghouse does not provide crash modification factors for decreasing driveway density in suburban areas, several studies show a decrease in angle, rear-end, and other crash types when driveway density is reduced.

the Bicycle Level of Service D. The safety analysis revealed that crashes along Westover Drive occur with greater frequency than predicted given the traffic volumes and roadway characteristics, and this is especially true for crashes resulting in injuries in the westernmost portion of the road, beyond Beech Avenue. Angle and head-on crashes comprise the majority of crashes resulting in injuries in the five segments within the four-lane portion that have the greatest potential for safety improvement.

Speed data indicates most vehicles are traveling well above the 40 mph posted speed limit. Although the scope of this study did not include public outreach to gain a representative understanding of public opinion, one resident during the site visit voiced concern over high speeds in the corridor and a desire to slow traffic down.

#### **4. Reconfiguration Options**

As previously described, Westover Drive has potential to serve as a key east-west multimodal connector, especially for bicyclists. Westover Drive is a lower speed, lower volume parallel alternative to Riverside Drive. EPR, P.C. developed three potential configurations, described in greater detail later in this section, for increasing the quality of bicycle facilities within the existing 36 feet of pavement (i.e. without requiring changes to the existing curb and gutter).

All three options reduce the number of travel lanes from four (two in each direction) to two. This conversion is known as a “road diet.” The prototypical road diet converts an undivided four-lane road into a three-lane configuration (two lanes with a center turn lane) and adds bicycle lanes. Usually the original four-lane configuration consists of 10 to 12-foot wide lanes, making the typical 3-lanes with bike lanes configuration possible. The nine-foot wide lanes of Westover Drive make it impossible to achieve this typical configuration. The three reconfiguration options for Westover Drive incorporate different aspects of the ideal road diet configuration, each with tradeoffs.

In most instances, a four-lane road with less than 10,000 vehicles per day is “a great candidate” for a road diet because “capacity will most likely not be affected.”<sup>14</sup> Road diets are “probably feasible” at or below 750 vehicles per hour per direction during the peak hour.<sup>15</sup> Daily and peak hour traffic volumes on Westover Drive fall well below these thresholds. Daily traffic volumes do not exceed 10,000 vehicles per day anywhere along the corridor, and peak hour volumes do not exceed 400 vehicles per hour per direction at any location in the four-lane section.

Road diets can reduce speed differential and have been shown to reduce 85<sup>th</sup> percentile and average speeds overall. Road diets are an especially useful tool for reducing high-end speeders. Reducing sideswipe crashes is another benefit of road diets.<sup>16</sup> According to the FHWA, reducing the number of travel lanes from 4 to 2-3 can be an effective way of controlling vehicle speeds to increase bicyclist and pedestrian safety and comfort. Road diets often reduce vehicle speeds and provide more consistent traffic flow with less “accordion-style” slow an effective way of controlling speeds.<sup>17</sup>

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<sup>14</sup> FHWA (2017). Road Diet FAQ. FHWA-SA-17-021.

[https://safety.fhwa.dot.gov/road\\_diets/resources/pdf/fhwas17021.pdf](https://safety.fhwa.dot.gov/road_diets/resources/pdf/fhwas17021.pdf)

<sup>15</sup> FHWA (2014). Road Diet Informational Guide. Report No. FHWA-SA-14-028.

[https://safety.fhwa.dot.gov/road\\_diets/guidance/info\\_guide/rdig.pdf](https://safety.fhwa.dot.gov/road_diets/guidance/info_guide/rdig.pdf)

<sup>16</sup> Ibid.

<sup>17</sup> Ibid. See also Bowman, N. and Dees, T. (2016). “Evaluating Road Diets with Big Data.”

<https://www.streetlightdata.com/evaluating-road-diets-with-big-data>

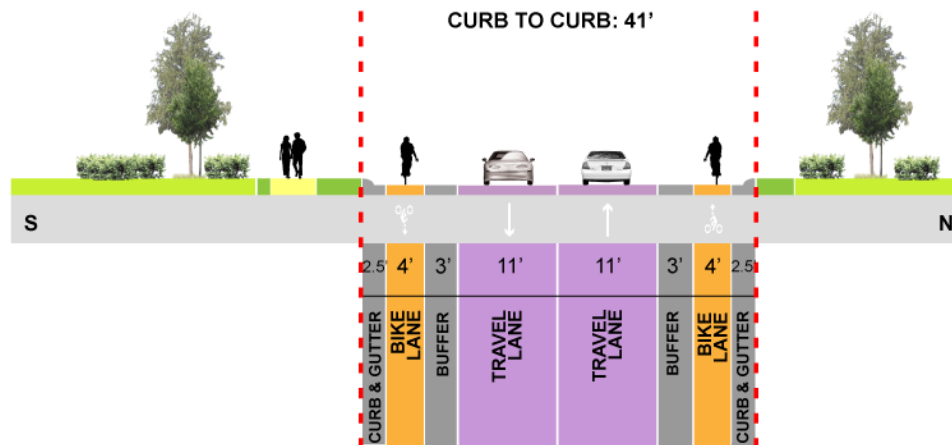
A combination of reducing speeds and providing on-street bicycle facilities will most effectively improve bicycle safety and comfort along Westover Drive. For this reason, **EPR, P.C. recommends the City consider reducing the speed limit to 35 mph as a first step.**

The first two options provide 11-foot wide vehicle travel lanes, not including the gutter pan, which is consistent with the VDOT Road Design Manual and recommendations in multiple other industry-standard design guidelines. The DRPT Multimodal System Design Guidelines recommend 11-foot wide lanes for all types of multimodal corridors that do not have transit modal emphasis or heavy truck traffic. The NACTO Urban Street Design Guide recommends that "lanes greater than 11 feet should not be used as they may cause unintended speeding" and states that "[lane widths less than 12 feet] help promote slower driving speeds which, in turn, reduce the severity of crashes."<sup>18</sup>

#### a. Option 1: On-Street Buffered Bicycle Lanes

Option 1, as illustrated in **Figure 7**, provides buffered on-street bicycle lanes designed in accordance with industry-standard design guidelines, including the AASHTO Guide for the Design of Bicycle Facilities, NACTO Urban Bikeway Design Guide, VDOT Road Design Manual, and DRPT Multimodal System Design Guidelines.

This configuration consists of four feet of pavement for the bicycle lane adjacent to (but not including) the gutter pan and three-feet of diagonally hatched buffer between the bicycle lane and the vehicle travel lane. **Figure 8** shows a photo of a similar configuration implemented in Raleigh, NC.



*Figure 8: Option 1: On-Street Buffered Bicycle Lanes Typical Section*

The NACTO Urban Bikeway Design Guide describes numerous benefits<sup>19</sup> of buffered bicycle lanes, including:

- Provides greater shy distance between motor vehicles and bicyclists
- Provides space for bicyclists to pass another bicyclist without encroaching into the adjacent motor vehicle lane

<sup>18</sup> <https://nacto.org/publication/urban-street-design-guide/street-design-elements/lane-width>

<sup>19</sup> <https://nacto.org/publication/urban-bikeway-design-guide/bike-lanes/buffered-bike-lanes>



- Provides greater space for bicycling without making the bike lane appear so wide that it might be mistaken for a travel lane or parking lane
- Appeals to a wider cross-section of bicycle users [as compared to a conventional bike lane]

Buffered bicycle lanes are especially preferable over conventional bicycle lanes on streets with high travel speeds. Together with the 11-foot travel lanes, this configuration option provides the most widely accepted accommodations for both motorized vehicles and bicyclists given the traffic volumes.

Given the current volumes, **this configuration option would produce a Level of Service C for automobiles during the peak hour and a Bicycle Level of Service A.** This



*Figure 9: Photo of a Curbside Buffered Bike Lane implemented on a 2-lane road.  
Photo credit: City of Raleigh, NC.*

provides a dramatic improvement over Bicycle LOS D with the existing configuration and still maintains an adequate level of service for automobiles.

**This configuration option could result in a small decrease in the predicted crash rate.** The 2010 HSM's method for computing how configuration improvements and other interventions uses crash modification factors (CMFs). CMFs for this specific configuration are not available, therefore it is not possible to calculate a specific reduction in the predicted crash rate using this method. However, by using VDOT's Extended HSM Spreadsheets, EPR calculated the predicted crash rate of a 2-lane roadway with an increased distance to roadside fixed objects. The resulting decrease in predicted crash rates is shown in **Table 4**.

*Table 4: Comparison of Predicted Crash Rates*

	Predicted Fatality and Injury Crashes (crashes/year)	Predicted Property Damage Only Crashes (crashes/year)	Predicted Total Crashes (crashes/year)
Undivided 4-Lane Configuration	3.4	5.6	8.6
2-Lane Configuration	3.0	5.3	8.1

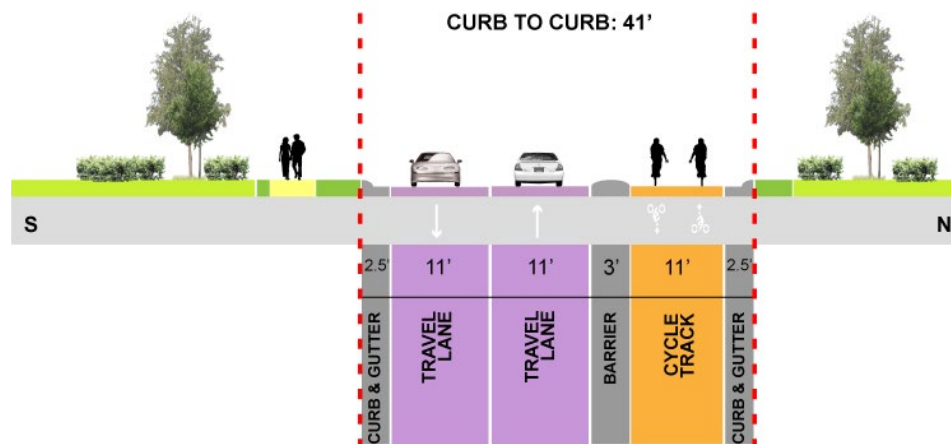


The decreases in **Table 4** do not account for the additional safety benefits of increasing the vehicle lane widths from nine feet to 11 feet and providing on-street bicycle lanes, which also increases the effective shoulder width. The 2010 HSM provides quantitative CMFs for increased lane and shoulder width for rural roadways but does not provide quantitative factors for urban or suburban arterials. The 2010 HSM acknowledges that providing dedicated bicycle lanes in urban areas appears to reduce crashes, but the magnitude of the crash effect is not certain at this time. This decrease also does not include CMFs for "road diets" because the available CMFs for road diets are based on conversions of four-lane roads to three-lane roads, as described later under Option 3. **It is anticipated that the average crash frequency for Option 1 would decrease more than shown for the two-lane configuration in Table 4,** however, EPR is unable to quantify the degree to which it would further decrease.

### b. Option 2: Cycle Track

Option 2 provides a two-way cycle track on one side of the roadway. Cycle tracks are different from bicycle lanes because they are physically separated from the vehicle travel lanes through either raised pavement, bollards, planter boxes, or other structures. Two-way roads ideally have one-way cycle tracks on both sides of the road. However, two-way cycle tracks may be used on streets where limited space prohibits two one-way cycle tracks.

**Figure 9** shows the typical section option for Westover Drive with cycle track on the north side of the street for illustrative purposes, but it could alternatively be located on the south side. **Figure 10** shows a similar concept implemented in Montreal, Quebec.



*Figure 10: Option 2: Cycle Track Typical Section*

Cycle tracks are typically used on streets with on-street parking. Applications on streets without on-street parking are less common. While cycle tracks in general improve perceived comfort and safety, two-way cycle tracks are not recommended on streets with frequent driveways and cross-streets. Raised pavement or other structures can pose issues for snow



*Figure 11: Photo of a Two-Way Cycle Track in Montreal, Quebec.*

*Photo credit: BikeTexas, Flickr*

removal, street sweeping, and other maintenance activities; although bollards or flexible delineators can be removed in the winter to improve access for snow removal equipment.

Because of the frequency of driveways and cross-streets along Westover Drive and special maintenance requirements, this option is not recommended for further consideration.

### **c. Option 3: Continuous Two-Way Left-Turn Lane**

Option 3 provides two shared travel lanes (one in each direction) and a two-way left turn lane in the middle of the road, as illustrated in **Figure 11**.<sup>20</sup> This option provides space for turning vehicles to wait for a gap in oncoming traffic without blocking vehicles behind them. **Figure 11** illustrates one potential configuration within the existing 36 feet of right-of-way with 13-foot wide shared travel lanes and a 10-foot wide two-way left turn lane. Another potential configuration could be two 11-foot wide travel lanes and a 14-foot two-way left turn lane, although this configuration provides less width for the lane to be shared between vehicles and bicycles.

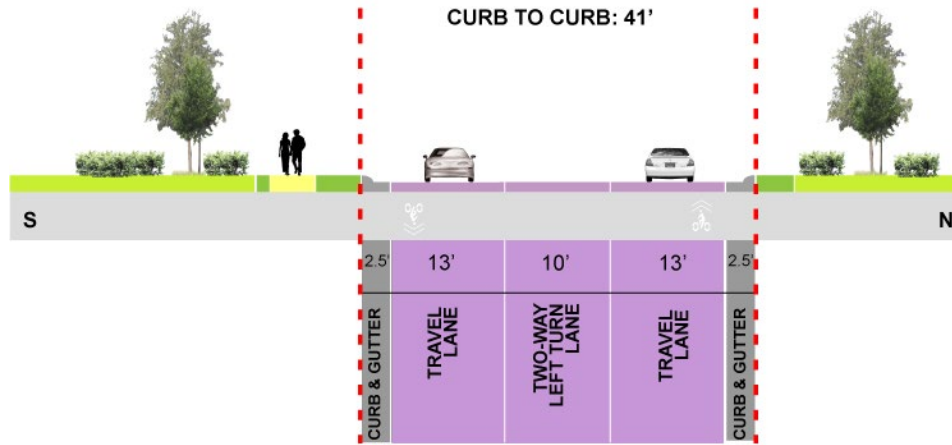
The safety benefits of this type of four-to-three lane conversion are well documented and quantifiable. The 2010 HSM indicates a four-lane to three-lane conversion can significantly reduce predicted crash rates – by roughly 30 percent on average for all crash types. This reduction is greater than the reduction shown in **Table 4** for the two-lane configuration.

Converting an undivided four lane road to two lanes with a center turn lane can particularly reduce rear-end and left-turn crashes because vehicles waiting to turn left do not stop in the through lane.

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<sup>20</sup> EPR, P.C. examined the possibility of raised medians, which are sometimes preferred because of landscaping and access management. Raised medians are not feasible along Westover Drive because of the frequency of driveways and lack of right-of-way for U-turns.

However, the turning movement counts indicate low left turn volumes at intersections. Low turning movements and volumes do not warrant turn lanes (see the following section for more information).



*Figure 12: Option 3: Two Way Left Turn Lane Typical Section*

Option 3 does not provide a separate space for bicyclists. It provides a wider lane for vehicles to share the lane with bicyclists, but a wider lane can encourage higher speeds.

This option is not recommended for further consideration for several reasons:

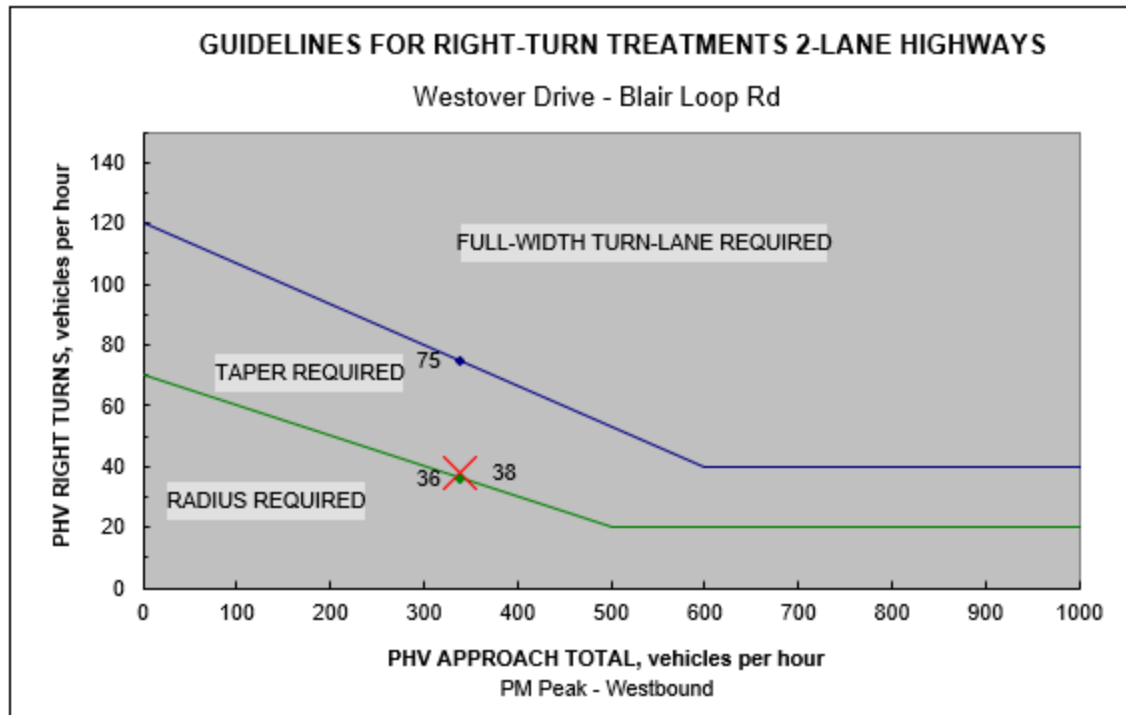
- It does not significantly improve facilities for bicyclists.
- The turning volumes do not warrant a left turn lane (as described in the following section).
- The wider lanes can encourage high speeds, exacerbating the speeding issue.

## 5. Turn Lane Warrant Analysis

EPR, P.C. analyzed the AM and PM peak hour turning movement counts of the six intersections to determine if the volumes warrant treatments for turning vehicles (e.g. turn lanes or tapers).

None of the intersections have volumes that currently warrant left or right turn lanes. Turning movements and volumes at all six intersections are well below the thresholds for a left turn lane warrant. Turning movements and volumes at five of the six intersections are well below the thresholds for any right turn treatment.

**PM peak hour volumes on the westbound approach at Blair Loop Road (east) will require a right turn taper with a two-lane configuration**, as illustrated in **Figure 12**. This is the only treatment required to accommodate turning vehicles needed for a two-lane typical section.



Source: VDOT Minimum Standards of Entrances to State Highways - Figure 5

*Figure 13: Right Turn Lane Warrant Analysis for PM Peak Hour Counts at Westbound Blair Loop Road. A right-turn taper will be required with a two-lane typical section at westbound Blair Loop Road. Of the intersections analyzed, this is the only one that will need a treatment for turning vehicles.*

As noted from the site visit observations, westbound vehicles turning right into the Quality Plus gas station queue back into the road. These vehicles were not included in the turning counts at Blair Loop Road. Based on the frequency of activity observed during the site visit, **EPR, P.C. recommends implementing a westbound right turn lane at this intersection, so vehicles can safely wait to turn into the gas station without blocking the westbound through lane.** This configuration could be achieved within the existing 36 feet of pavement as illustrated in **Figure 14**, shown with a transition from the typical section of Option 1: On-Street Buffered Bicycle Lanes.

The configuration illustrated in **Figure 14** does not provide an eastbound left turn lane. Based on the data available, EPR, P.C. was unable to determine if eastbound left turning vehicles are posing a similar problem of queuing in the travel lane. EPR did not observe this problem during the site visit which occurred during off-peak hours. EPR recommends the City count turning vehicles into and out of the gas station in both directions on a typical weekday and examine how frequently vehicles queue in either direction.





*Figure 14: Transition to westbound right turn lane at Quality Plus gas station to allow right turning vehicles to wait without blocking the westbound through lane. A high-resolution version of this image is provided in Attachment E.*

## 6. Recommendations

Given the context of Westover Drive as a key east-west connection in the regional and local bicycle network, low vehicle volumes, and high speeds, **EPR, P.C. recommends the City implement Option 1: On-Street Buffered Bicycle Lanes and reduce the speed limit to 35 miles per hour.** Two vehicle-through lanes will provide adequate capacity for the current traffic volumes. The buffered bicycle lanes will provide a dedicated space for bicyclists with a buffer between the vehicle lane. This configuration dramatically improves the level of service for bicyclists and maintains an adequate level of service for automobiles. The reduction in speed is consistent with current literature and recommendations to improve the bicycling environment.

The City should design the buffered bicycle lane in accordance with the NACTO Urban Bikeway Design Guide<sup>21</sup>, which provides detailed guidance on striping and diagonal hatching widths, angles, and frequency, marking conventions such as dashing at driveways, and resources for other information.

<sup>21</sup> See <https://nacto.org/publication/urban-bikeway-design-guide/bike-lanes/buffered-bike-lanes/>

EPR recommends the City initiate a speed enforcement campaign at the same time as lowering the speed limit. Digital radar speed signs, like the one shown in **Figure 15**, alert drivers of their speed compared to the posted speed limit and can be effective at slowing down speeding drivers and increasing speed limit compliance. Another strategy for speed enforcement is using the local police department to write tickets.

**Immediate next steps** should include:

- Counting turning volumes at Quality Plus gas station to determine if eastbound left turning vehicles need to be accommodated with a turn lane.
- Develop design drawings and hold a public meeting to gauge public opinion and hear concerns.

By reducing speeds and providing a dedicated space for bicyclists, Westover Drive can serve as a key east-west connection for local residents, bicycle commuters, and bicycle tourists, and provide safety benefits for motorists and all road users.



**Figure 15: Digital Radar Speed Sign** to alert drivers of their speed and slow speeding drivers down in Jackson, MI.  
*Photo credit: Evan Sasiela, MLive.*



**Attachments –**

Attachment A: 48-Hour Traffic Volume Counts and Speeds

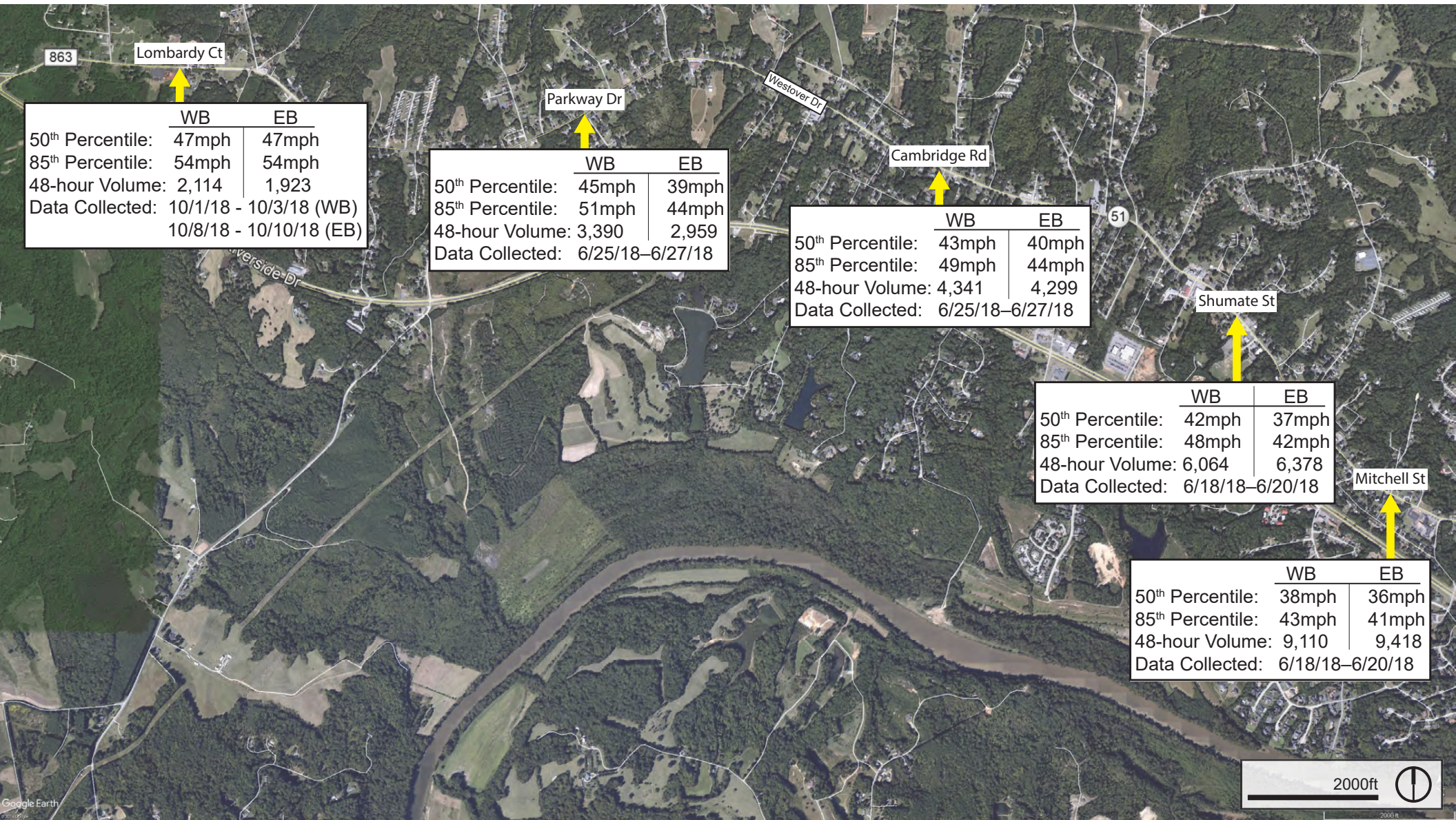
Attachment B: AM Peak Hour Turning Movement Counts

Attachment C: PM Peak Hour Turning Movement Counts

Attachment D: Crash Data

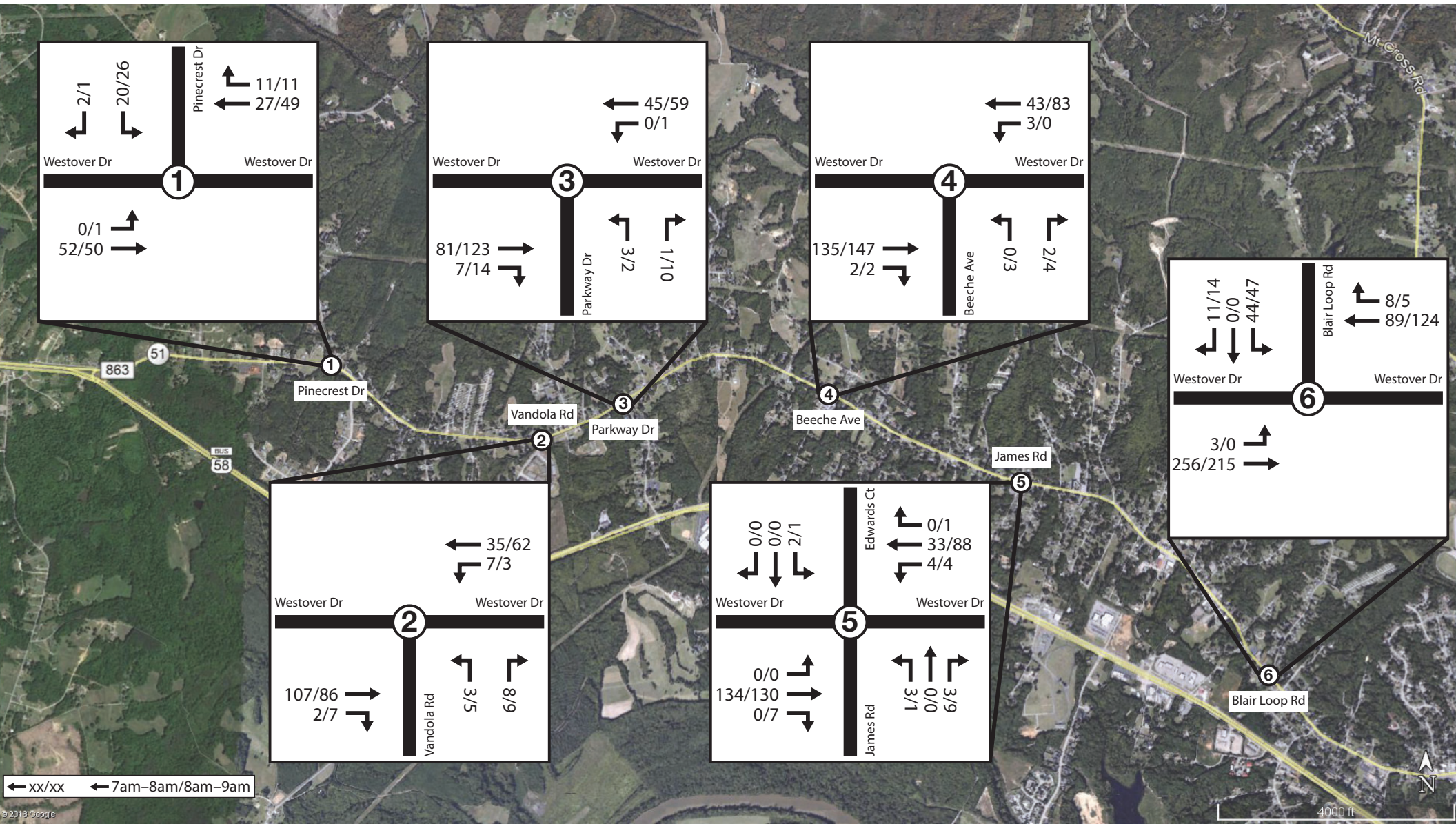
Attachment E: Rendering of Buffered On-Street Bicycle Lanes

# ATTACHMENT A: 48-HOUR TRAFFIC VOLUME COUNTS AND SPEEDS



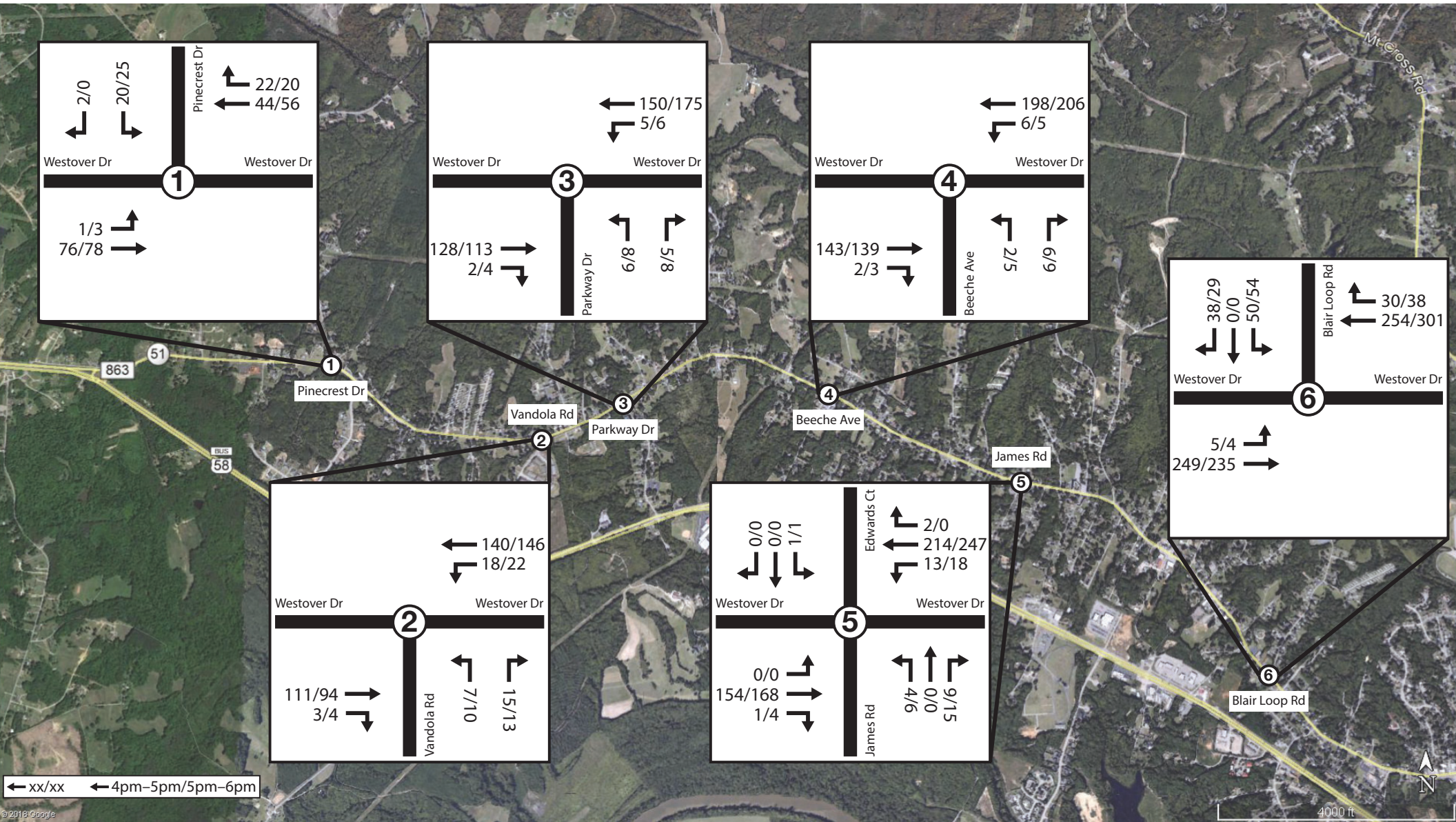


ATTACHMENT B: AM PEAK HOUR TURNING MOVEMENT COUNTS

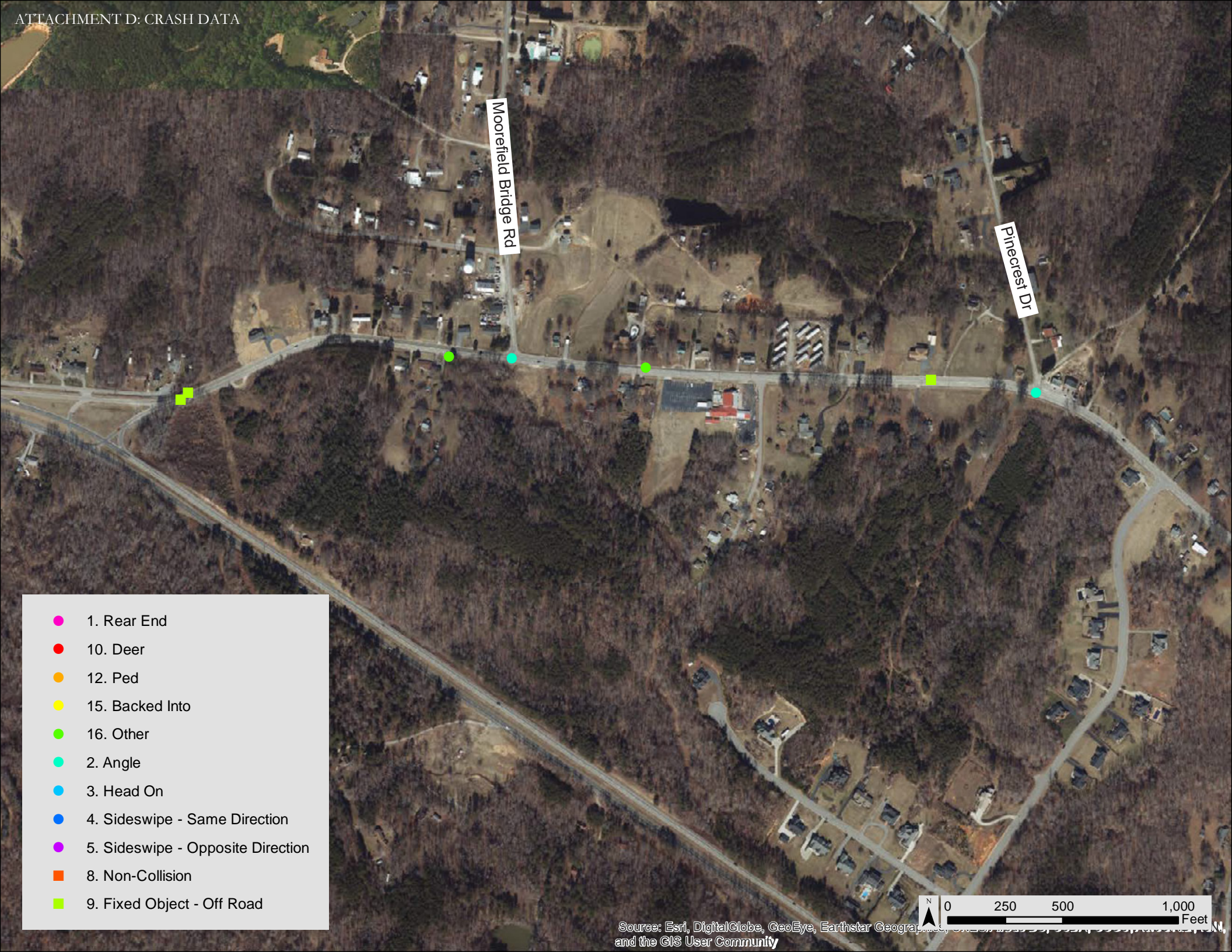




# ATTACHMENT C: PM PEAK HOUR TURNING MOVEMENT COUNTS

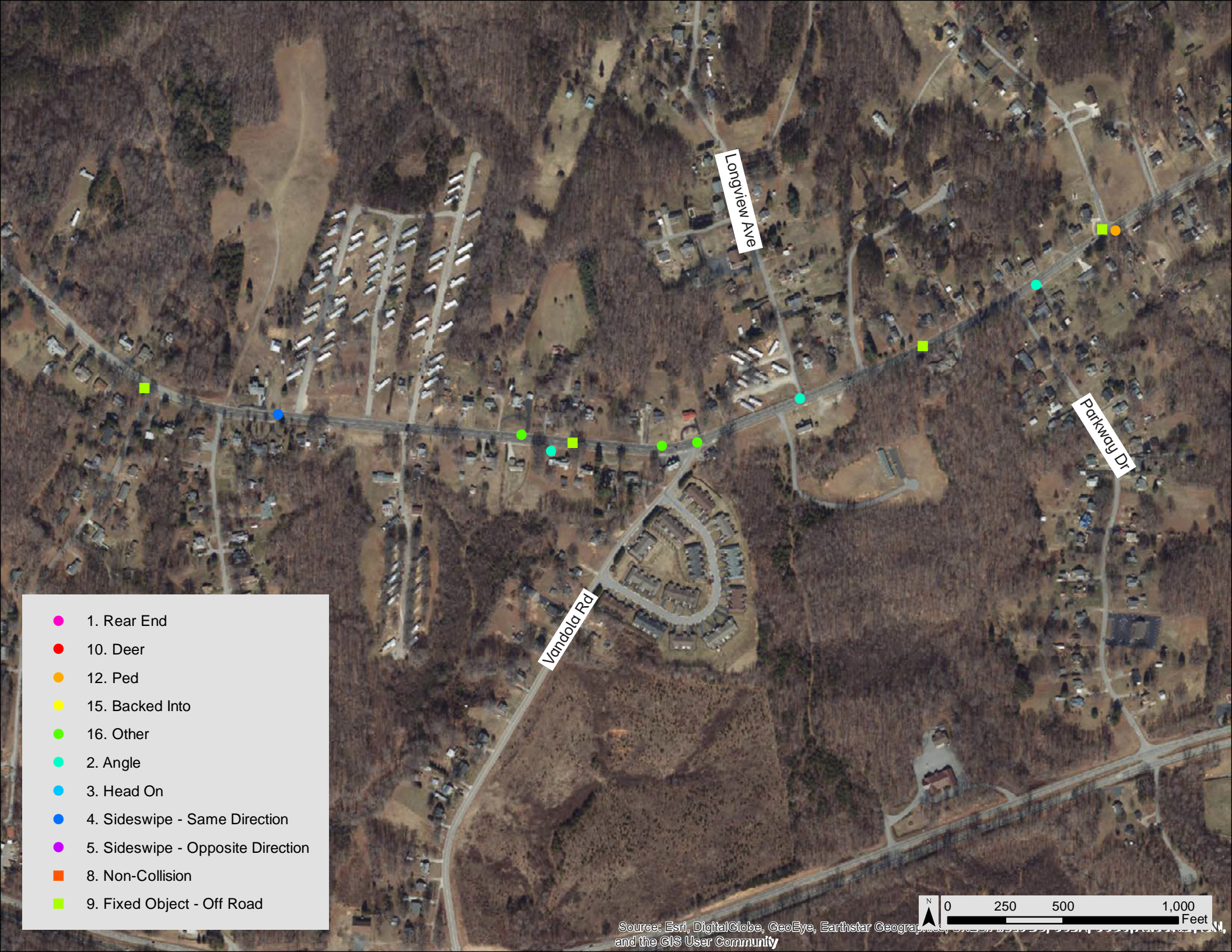






- 1. Rear End
- 10. Deer
- 12. Ped
- 15. Backed Into
- 16. Other
- 2. Angle
- 3. Head On
- 4. Sideswipe - Same Direction
- 5. Sideswipe - Opposite Direction
- 8. Non-Collision
- 9. Fixed Object - Off Road

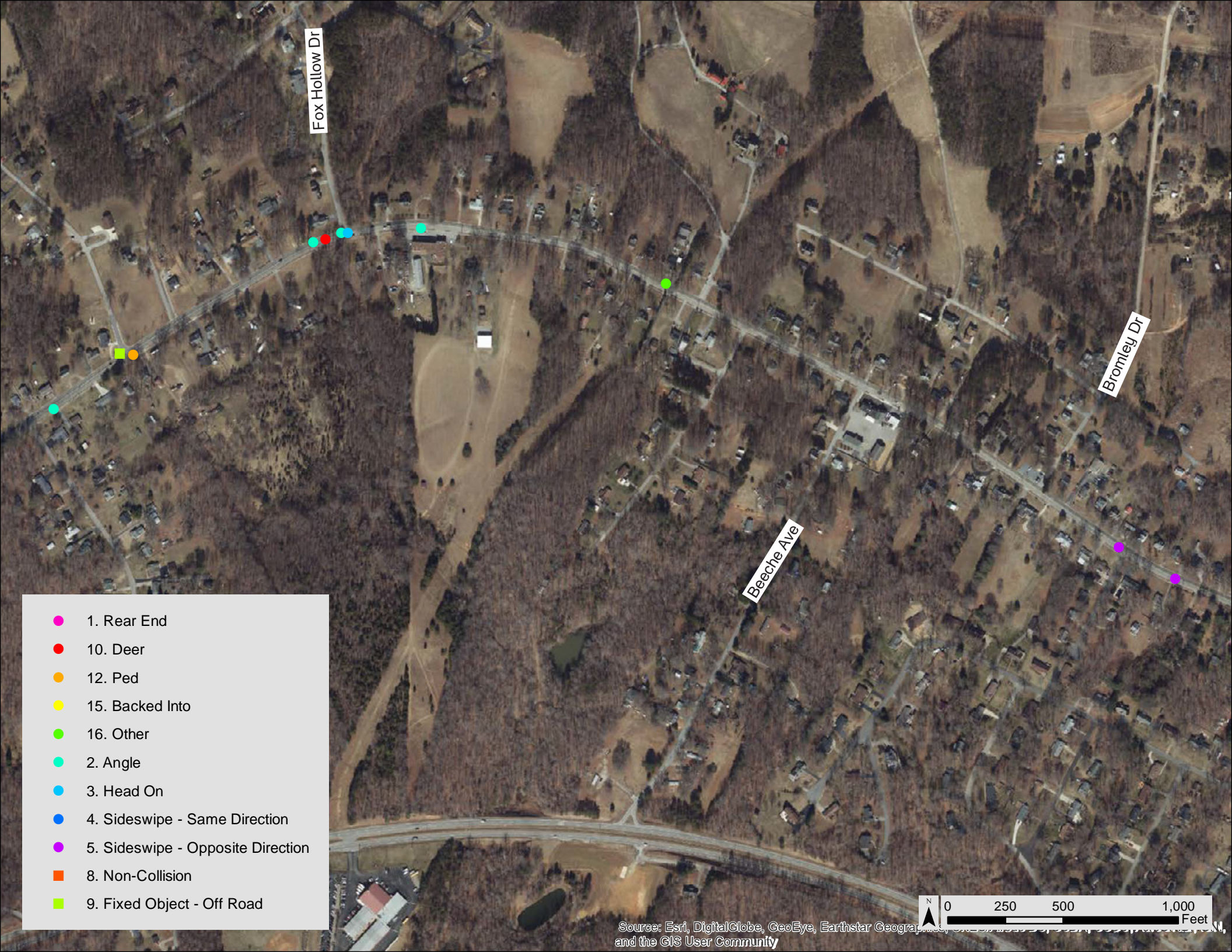




- 1. Rear End
- 10. Deer
- 12. Ped
- 15. Backed Into
- 16. Other
- 2. Angle
- 3. Head On
- 4. Sideswipe - Same Direction
- 5. Sideswipe - Opposite Direction
- 8. Non-Collision
- 9. Fixed Object - Off Road







- 1. Rear End
- 10. Deer
- 12. Ped
- 15. Backed Into
- 16. Other
- 2. Angle
- 3. Head On
- 4. Sideswipe - Same Direction
- 5. Sideswipe - Opposite Direction
- 8. Non-Collision
- 9. Fixed Object - Off Road





Lamberth Dr

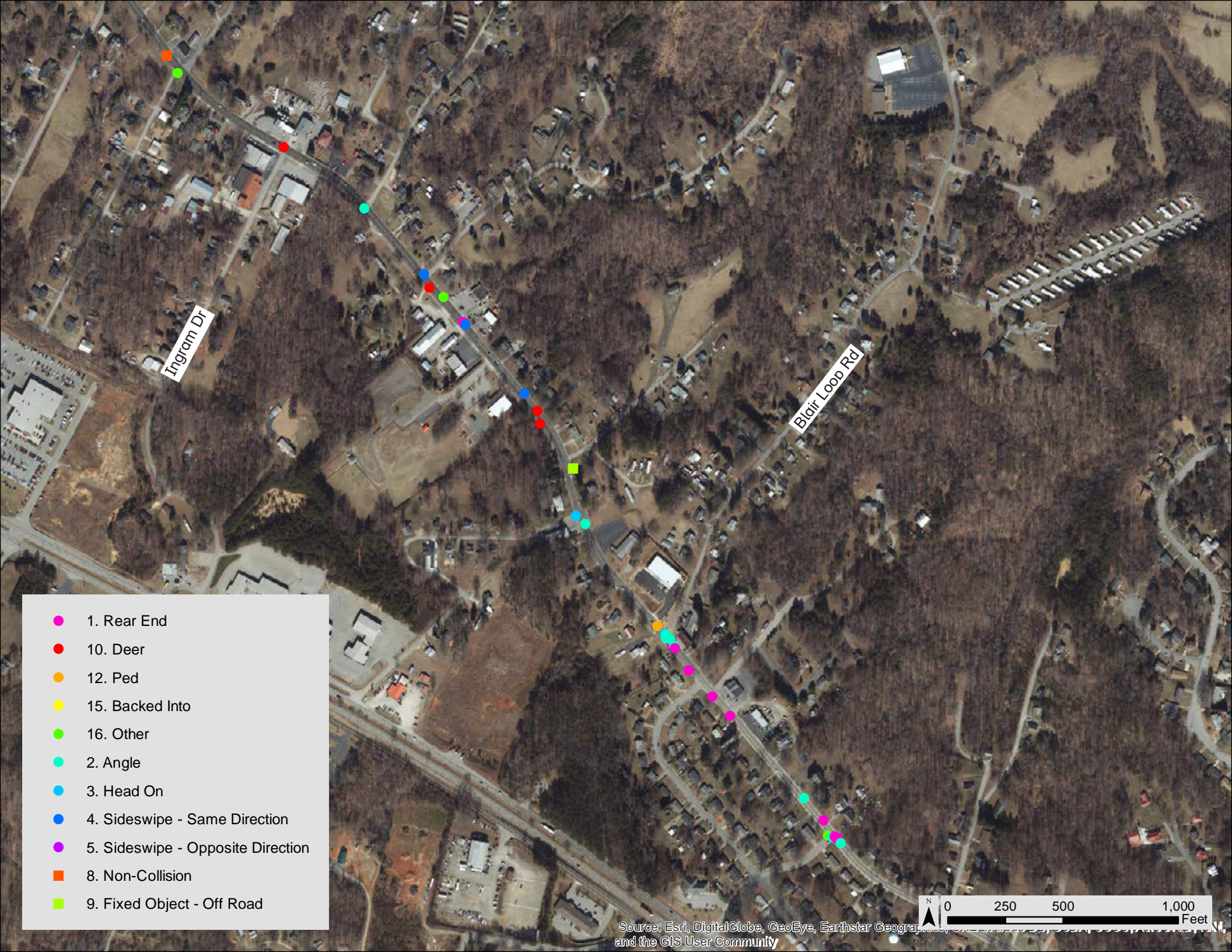
James Rd

Woodlawn Dr

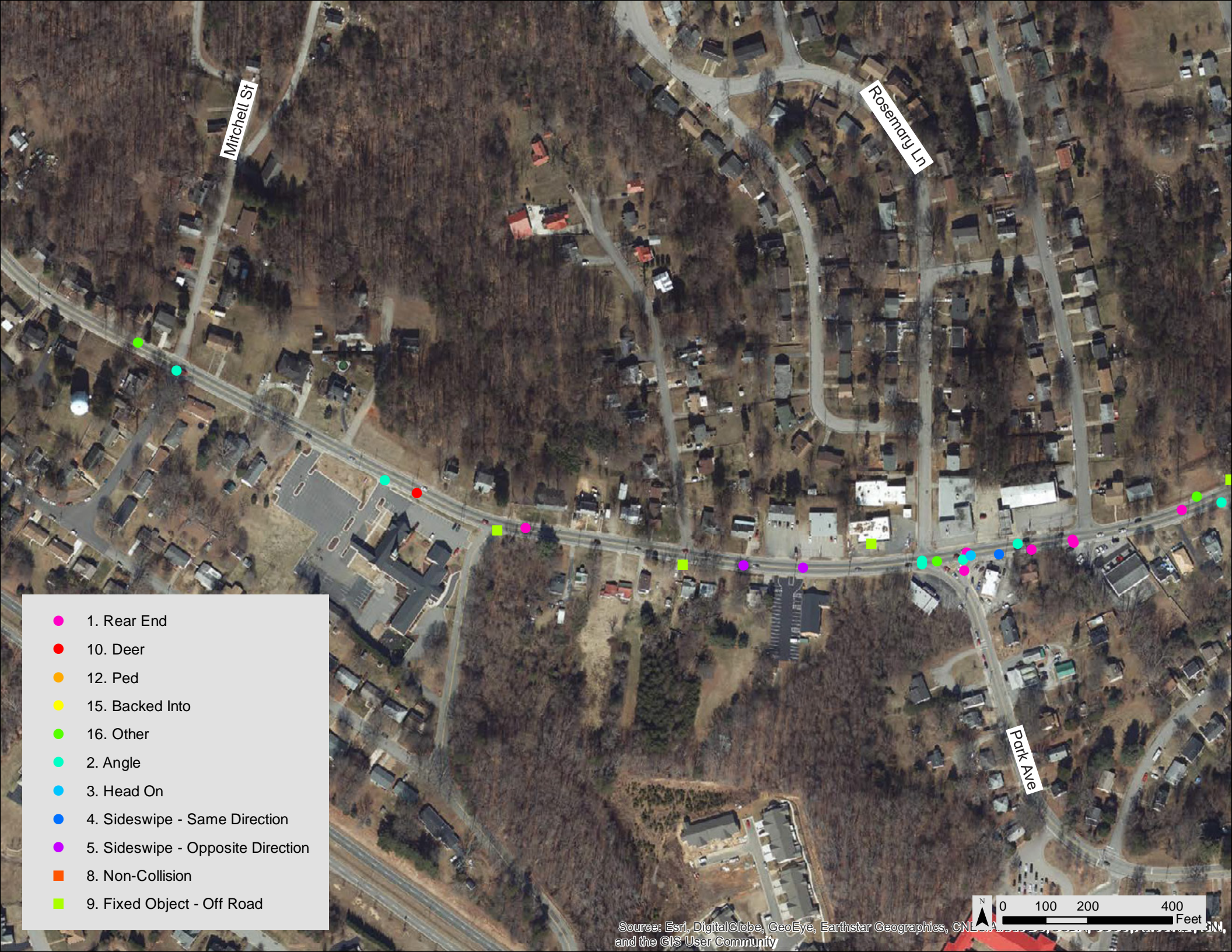
- 1. Rear End
- 10. Deer
- 12. Ped
- 15. Backed Into
- 16. Other
- 2. Angle
- 3. Head On
- 4. Sideswipe - Same Direction
- 5. Sideswipe - Opposite Direction
- 8. Non-Collision
- 9. Fixed Object - Off Road









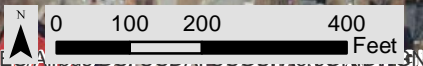


Mitchell St

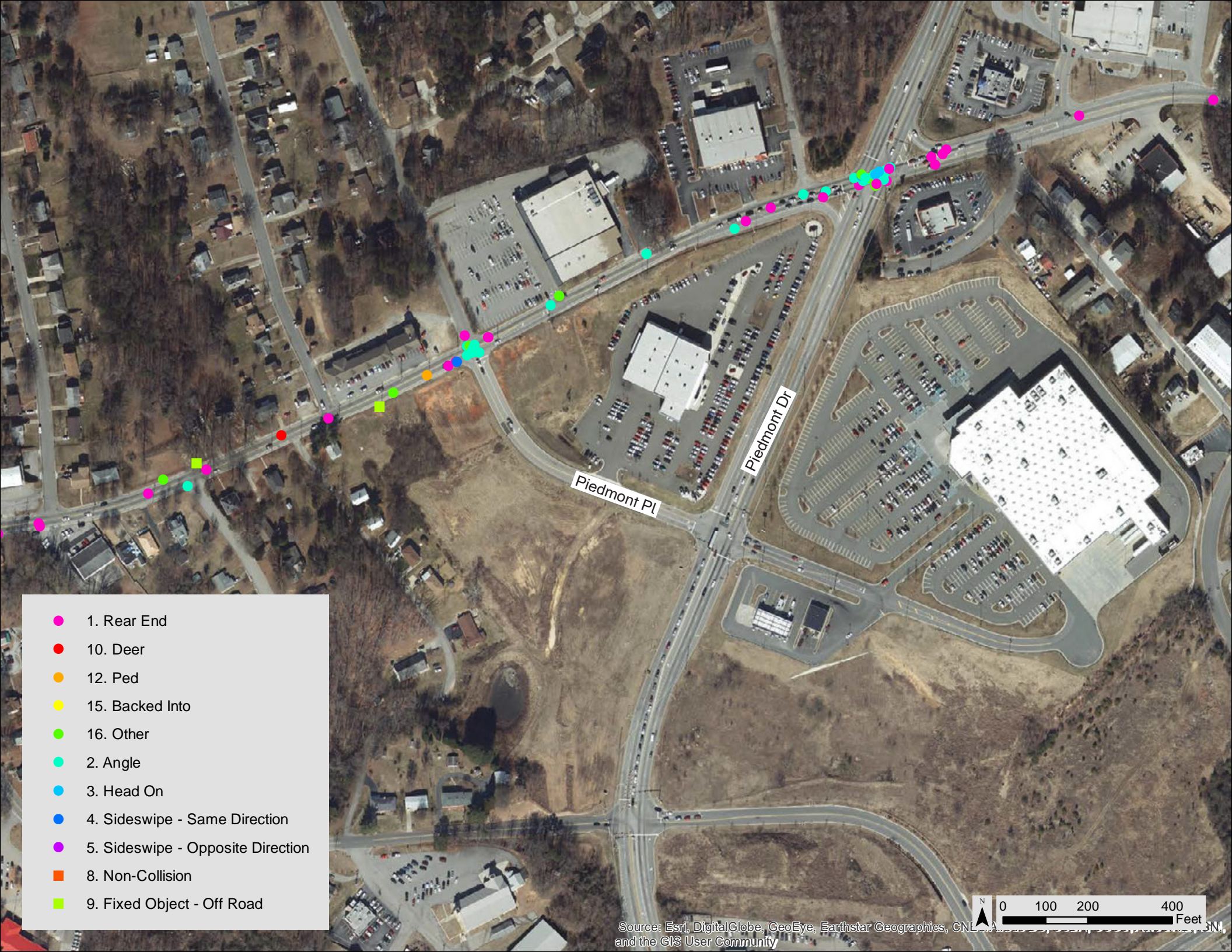
Rosemary Ln

Park Ave

- 1. Rear End
- 10. Deer
- 12. Ped
- 15. Backed Into
- 16. Other
- 2. Angle
- 3. Head On
- 4. Sideswipe - Same Direction
- 5. Sideswipe - Opposite Direction
- 8. Non-Collision
- 9. Fixed Object - Off Road

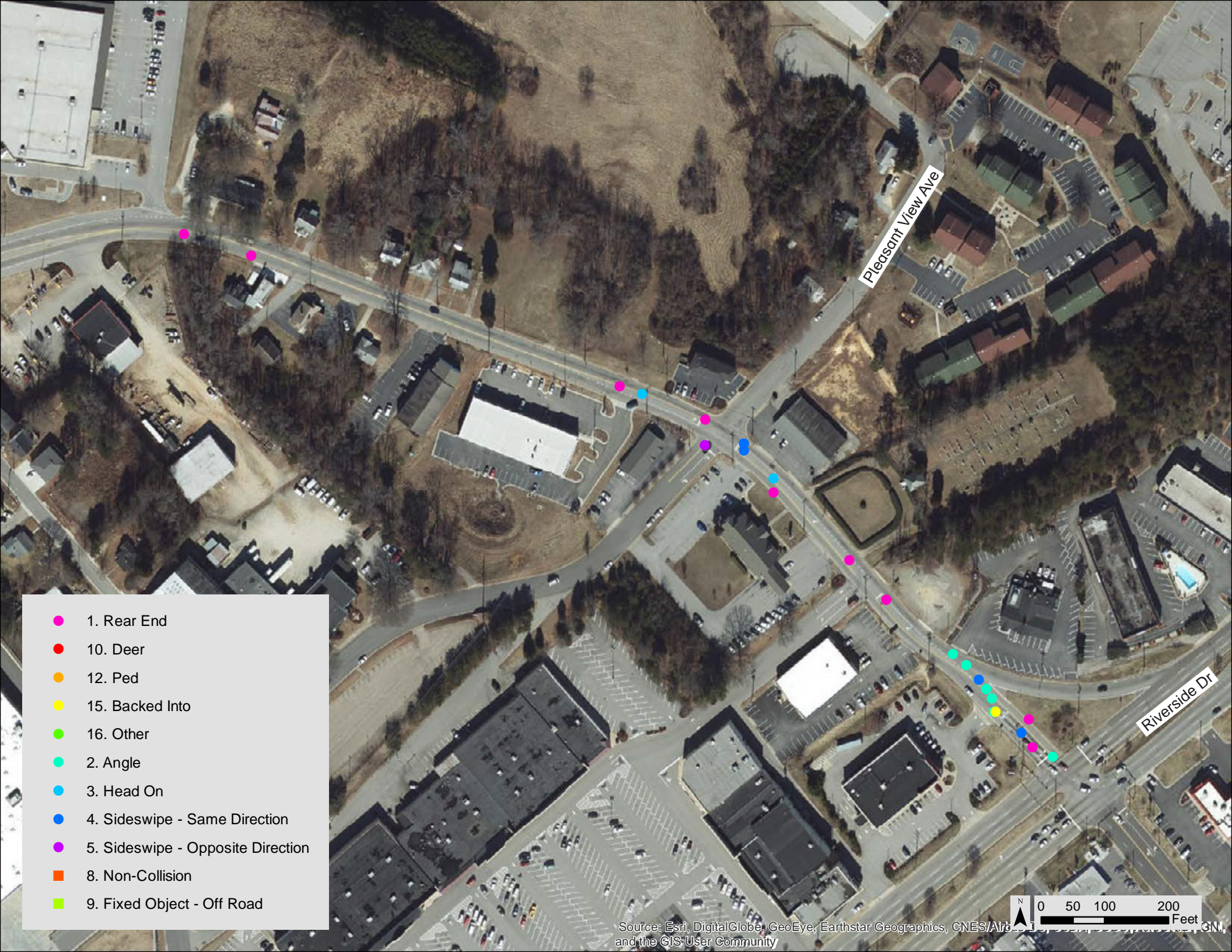






- 1. Rear End
- 10. Deer
- 12. Ped
- 15. Backed Into
- 16. Other
- 2. Angle
- 3. Head On
- 4. Sideswipe - Same Direction
- 5. Sideswipe - Opposite Direction
- 8. Non-Collision
- 9. Fixed Object - Off Road





Pleasant View Ave

Riverside Dr

- 1. Rear End
- 10. Deer
- 12. Ped
- 15. Backed Into
- 16. Other
- 2. Angle
- 3. Head On
- 4. Sideswipe - Same Direction
- 5. Sideswipe - Opposite Direction
- 8. Non-Collision
- 9. Fixed Object - Off Road





ID	Document Nbr	Type	Severity	Date	Time	LAT	LON	Weather_Cond	Roadway_Surf	Light_Cond	Ped_Not	Bike_Not	Speed_Not	Belted_Unbelted	Alcohol_Not	Distracted_Not
1	143395117	1. Rear End	C.Non-visible Injury	12/4/2014	1735	36.58623	-79.43596	5. Rain	2. Wet	5. Darkness - Road Not Lighted	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
2	180435205	9. Fixed Object - Off Road	C.Non-visible Injury	2/9/2018	2229	36.58631	-79.43555	1. No Adverse Condition (Clear/Cloudy)	1. Dry	4. Darkness - Road Lighted	Not PED	Not BIKE	SPEED		Not ALCOHOL	
3	162095250	16. Other	PDO.Property Damage Only	7/26/2016	1550	36.5864	-79.43544	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
4	160195148	12. Ped	A.Ambulatory Injury	1/15/2016	1930	36.58652	-79.43517	5. Rain	2. Wet	4. Darkness - Road Lighted	PED	Not BIKE	Not SPEED		Not ALCOHOL	
5	142095103	1. Rear End	PDO.Property Damage Only	7/26/2014	1822	36.58658	-79.435	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
6	143425177	1. Rear End	C.Non-visible Injury	12/6/2014	2015	36.58661	-79.43494	1. No Adverse Condition (Clear/Cloudy)	2. Wet	4. Darkness - Road Lighted	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
7	161445237	4. Sideswipe - Same Direction	PDO.Property Damage Only	5/21/2016	1645	36.58661	-79.43493	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
8	150265133	2. Angle	PDO.Property Damage Only	1/24/2015	1830	36.58665	-79.43485	1. No Adverse Condition (Clear/Cloudy)	1. Dry	4. Darkness - Road Lighted	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
9	150615313	2. Angle	C.Non-visible Injury	2/28/2015	1350	36.58671	-79.43485	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
10	133605202	2. Angle	PDO.Property Damage Only	12/23/2013	1530	36.59496	-79.45423	5. Rain	2. Wet	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
11	130285263	4. Sideswipe - Same Direction	PDO.Property Damage Only	1/28/2013	250	36.59418	-79.45334	5. Rain	2. Wet	4. Darkness - Road Lighted	Not PED	Not BIKE	Not SPEED		ALCOHOL	
12	172335167	10. Deer	B.Visible Injury	8/18/2017	2312	36.59402	-79.45326	1. No Adverse Condition (Clear/Cloudy)	1. Dry	4. Darkness - Road Lighted	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
13	150935243	16. Other	C.Non-visible Injury	4/3/2015	1245	36.59391	-79.45305	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
14	162595147	1. Rear End	PDO.Property Damage Only	9/14/2016	1024	36.59362	-79.45275	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
15	173195205	4. Sideswipe - Same Direction	PDO.Property Damage Only	11/14/2017	1315	36.59359	-79.45272	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	DISTRACTED
16	140305086	4. Sideswipe - Same Direction	PDO.Property Damage Only	1/29/2014	1800	36.59278	-79.45184	1. No Adverse Condition (Clear/Cloudy)	1. Dry	4. Darkness - Road Lighted	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
17	130595226	10. Deer	PDO.Property Damage Only	2/28/2013	739	36.59257	-79.45164	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
18	152455060	10. Deer	C.Non-visible Injury	9/2/2015	451	36.59242	-79.4516	1. No Adverse Condition (Clear/Cloudy)	1. Dry	5. Darkness - Road Not Lighted	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
19	151115073	9. Fixed Object - Off Road	C.Non-visible Injury	4/21/2015	1146	36.59189	-79.45111	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
20	161065200	9. Fixed Object - Off Road	PDO.Property Damage Only	4/15/2016	150	36.60082	-79.46972	1. No Adverse Condition (Clear/Cloudy)	1. Dry	4. Darkness - Road Lighted	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
21	130285199	2. Angle	C.Non-visible Injury	1/25/2013	1430	36.6005	-79.46898	6. Snow	4. Icy	2. Daylight	Not PED	Not BIKE	SPEED		Not ALCOHOL	
22	133295206	2. Angle	PDO.Property Damage Only	11/22/2013	1528	36.60034	-79.46856	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
23	170745099	9. Fixed Object - Off Road	C.Non-visible Injury	3/8/2017	1741	36.60048	-79.46826	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	SPEED		Not ALCOHOL	DISTRACTED
24	171635201	10. Deer	A.Ambulatory Injury	6/10/2017	1007	36.59929	-79.46526	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
25	141335087	3. Head On	B.Visible Injury	5/12/2014	1039	36.59926	-79.46523	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	SPEED		Not ALCOHOL	DISTRACTED
26	170765101	2. Angle	PDO.Property Damage Only	3/16/2017	1053	36.59899	-79.46396	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	SPEED		Not ALCOHOL	
27	172195330	2. Angle	C.Non-visible Injury	8/5/2017	1221	36.59899	-79.4639	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
28	143355153	1. Rear End	C.Non-visible Injury	11/24/2014	1443	36.59884	-79.46254	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
29	160395216	16. Other	PDO.Property Damage Only	2/8/2016	3	36.58671	-79.43483	1. No Adverse Condition (Clear/Cloudy)	1. Dry	4. Darkness - Road Lighted	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
30	153235126	2. Angle	C.Non-visible Injury	11/17/2015	1324	36.58668	-79.43481	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
31	162815094	2. Angle	PDO.Property Damage Only	10/5/2016	1247	36.58667	-79.4348	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
32	143355227	1. Rear End	PDO.Property Damage Only	12/19/2014	1030	36.58678	-79.43487	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
33	170515109	2. Angle	C.Non-visible Injury	2/17/2017	1618	36.58669	-79.4348	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
34	181135207	2. Angle	B.Visible Injury	4/15/2018	1330	36.58672	-79.43479	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	DISTRACTED
35	170525128	2. Angle	C.Non-visible Injury	2/18/2017	1815	36.58667	-79.43475	1. No Adverse Condition (Clear/Cloudy)	1. Dry	4. Darkness - Road Lighted	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
36	170695079	1. Rear End	C.Non-visible Injury	3/9/2017	1236	36.58677	-79.43468	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
37	173555194	1. Rear End	C.Non-visible Injury	12/20/2017	957	36.58677	-79.43468	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	SPEED		Not ALCOHOL	DISTRACTED
38	131615241	2. Angle	C.Non-visible Injury	6/7/2013	1412	36.58698	-79.43418	5. Rain	2. Wet	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
39	163145160	16. Other	PDO.Property Damage Only	11/8/2016	1759	36.58704	-79.43411	1. No Adverse Condition (Clear/Cloudy)	1. Dry	4. Darkness - Road Lighted	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
40	160195147	2. Angle	PDO.Property Damage Only	1/15/2016	1843	36.58732	-79.43341	5. Rain	2. Wet	4. Darkness - Road Lighted	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
41	150345195	2. Angle	C.Non-visible Injury	2/2/2015	1349	36.58749	-79.4327	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED	UNBELTED	Not ALCOHOL	
42	143355249	1. Rear End	PDO.Property Damage Only	11/26/2014	1630	36.58754	-79.43261	4. Mist	2. Wet	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
43	150585069	1. Rear End	PDO.Property Damage Only	2/25/2015	1800	36.58763	-79.43241	1. No Adverse Condition (Clear/Cloudy)	1. Dry	4. Darkness - Road Lighted	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
44	132895091	2. Angle	PDO.Property Damage Only	10/15/2013	1420	36.58772	-79.43215	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
45	181435166	2. Angle	C.Non-visible Injury	5/21/2018	1103	36.58774	-79.43197	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED	UNBELTED	Not ALCOHOL	
46	131775083	1. Rear End	C.Non-visible Injury	6/25/2013	1430	36.5877	-79.43199	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	DISTRACTED
47	173315328	3. Head On	B.Visible Injury	11/16/2017	1210	36.59132	-79.45106	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	SPEED	UNBELTED	ALCOHOL	
48	172005182	2. Angle	A.Ambulatory Injury	7/18/2017	1821	36.59123	-79.45092	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
49	173525304	12. Ped	K.Fatal Injury	12/30/2017	1815	36.59002	-79.44984	1. No Adverse Condition (Clear/Cloudy)	1. Dry	4. Darkness - Road Lighted	PED	Not BIKE	Not SPEED		Not ALCOHOL	DISTRACTED
50	160325129	3. Head On	C.Non-visible Injury	1/30/2016	1220	36.58993	-79.44973	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
51	171795102	2. Angle	C.Non-visible Injury	6/26/2017	1251	36.58992	-79.44971	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
52	133015164	2. Angle	C.Non-visible Injury	10/25/2013	1352	36.58988	-79.44971	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
53	130575096	1. Rear End	PDO.Property Damage Only	2/25/2013	1718	36.58981	-79.44963	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
54	132875227	2. Angle	PDO.Property Damage Only	10/13/2013	1530	36.58987	-79.44965	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
55	153135102	2. Angle	PDO.Property Damage Only	11/6/2015	1131	36.58979	-79.44959	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
56	162855321	1. Rear End	PDO.Property Damage Only	10/10/2016	1359	36.58976	-79.44958	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
57	133175117	1. Rear End	C.Non-visible Injury	11/11/2013	927	36.5895	-79.44937	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
58	150065091	1. Rear End	PDO.Property Damage Only	1/5/2015	1530	36.58919	-79.44902	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
59	151545231	1. Rear End	C.Non-visible Injury	6/3/2013	858	36.58896	-79.44875	5. Rain	2. Wet	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	DISTRACTED
60	171795131	2. Angle	C.Non-visible Injury	6/27/2017	1606	36.58799	-79.44765	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	SPEED		Not ALCOHOL	
61	132285172	1. Rear End	C.Non-visible Injury	8/15/2013	1919	36.58773	-79.44736	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
62	171005096	16. Other	C.Non-visible Injury	4/8/2017	1440	36.58755	-79.44729	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
63	150475085	1. Rear End	PDO.Property Damage Only	2/13/2015	1845	36.58754	-79.44721	1. No Adverse Condition (Clear/Cloudy)	1. Dry	4. Darkness - Road Lighted	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
64	181175164	2. Angle	PDO.Property Damage Only	4/26/2018	1235	36.58753	-79.44722	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
65	152155067	1. Rear End	PDO.Property Damage Only	7/31/2015	1441	36.58754	-79.44719	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
66	133095152	16. Other	B.Visible Injury	11/4/2013	1501	36.58778	-79.43157	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
67	161485212	1. Rear End	PDO.Property Damage Only	5/26/2016	1440	36.58781	-79.43148	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
68	150305065	2. Angle	C.Non-visible Injury	1/29/2015	1706	36.58782	-79.4315	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	

69	172615193	3. Head On	C.Non-visible Injury	9/16/2017	133	36.58785	-79.43157	1. No Adverse Condition (Clear/Cloudy)	1. Dry	4. Darkness - Road Lighted	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
70	162295071	2. Angle	B.Visible Injury	8/15/2016	1645	36.58784	-79.43153	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
71	151065109	2. Angle	C.Non-visible Injury	4/15/2015	1105	36.58785	-79.4315	5. Rain	2. Wet	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
72	181385195	2. Angle	PDO.Property Damage Only	5/17/2018	2143	36.58788	-79.43149	1. No Adverse Condition (Clear/Cloudy)	1. Dry	4. Darkness - Road Lighted	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
73	173395304	2. Angle	C.Non-visible Injury	12/3/2017	2301	36.5879	-79.43145	1. No Adverse Condition (Clear/Cloudy)	1. Dry	4. Darkness - Road Lighted	Not PED	Not BIKE	SPEED		Not ALCOHOL	
74	161395220	9. Fixed Object - Off Road	A.Ambulatory Injury	5/18/2016	133	36.60165	-79.50052	1. No Adverse Condition (Clear/Cloudy)	2. Wet	4. Darkness - Road Lighted	Not PED	Not BIKE	Not SPEED		ALCOHOL	
75	141675245	1. Rear End	C.Non-visible Injury	6/14/2014	1130	36.58778	-79.4317	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	SPEED		Not ALCOHOL	
76	162295226	2. Angle	PDO.Property Damage Only	8/16/2016	905	36.58783	-79.43174	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	SPEED		Not ALCOHOL	
77	180315115	2. Angle	C.Non-visible Injury	1/29/2018	1316	36.58781	-79.43167	5. Rain	2. Wet	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
78	143605123	2. Angle	C.Non-visible Injury	12/24/2014	1125	36.58783	-79.43168	5. Rain	2. Wet	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
79	173525376	2. Angle	C.Non-visible Injury	12/16/2017	1411	36.58782	-79.43164	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		ALCOHOL	
80	170625091	3. Head On	A.Ambulatory Injury	3/2/2017	2343	36.58784	-79.43168	1. No Adverse Condition (Clear/Cloudy)	1. Dry	4. Darknss - Road Lighted	Not PED	Not BIKE	SPEED		ALCOHOL	
81	162915343	16. Other	PDO.Property Damage Only	10/16/2016	1037	36.58783	-79.43162	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
82	160555129	16. Other	PDO.Property Damage Only	2/23/2016	1840	36.58785	-79.43168	4. Mist	1. Dry	4. Darkness - Road Lighted	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
83	150125174	2. Angle	PDO.Property Damage Only	1/11/2015	1223	36.58785	-79.43158	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
84	161395213	3. Head On	PDO.Property Damage Only	5/17/2016	745	36.58785	-79.43157	5. Rain	2. Wet	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
85	150355070	9. Fixed Object - Off Road	PDO.Property Damage Only	2/3/2015	1412	36.60477	-79.50676	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
86	170665066	3. Head On	C.Non-visible Injury	3/6/2017	1930	36.58787	-79.43154	1. No Adverse Condition (Clear/Cloudy)	1. Dry	4. Darkness - Road Lighted	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
87	143215131	2. Angle	C.Non-visible Injury	11/16/2014	1332	36.60463	-79.50521	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
88	181365178	5. Sideswipe - Opposite Direction	C.Non-visible Injury	5/15/2018	1230	36.58747	-79.42605	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
89	143365075	1. Rear End	PDO.Property Damage Only	12/1/2014	1745	36.58532	-79.43916	1. No Adverse Condition (Clear/Cloudy)	1. Dry	3. Dusk	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	DISTRACTED
90	170585175	16. Other	A.Ambulatory Injury	2/26/2017	107	36.60499	-79.51389	1. No Adverse Condition (Clear/Cloudy)	1. Dry	4. Darkness - Road Lighted	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
91	132685116	4. Sideswipe - Same Direction	C.Non-visible Injury	9/24/2013	848	36.60135	-79.49854	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
92	170815189	16. Other	PDO.Property Damage Only	3/20/2017	954	36.60114	-79.49494	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	SPEED		Not ALCOHOL	DISTRACTED
93	150405058	2. Angle	PDO.Property Damage Only	2/7/2015	213	36.60095	-79.4945	1. No Adverse Condition (Clear/Cloudy)	1. Dry	4. Darkness - Road Lighted	Not PED	Not BIKE	Not SPEED	UNBELTED	ALCOHOL	DISTRACTED
94	152085153	9. Fixed Object - Off Road	B.Visible Injury	7/27/2015	1	36.60105	-79.49418	1. No Adverse Condition (Clear/Cloudy)	1. Dry	4. Darkness - Road Lighted	Not PED	Not BIKE	Not SPEED		ALCOHOL	
95	180095458	16. Other	C.Non-visible Injury	1/9/2018	928	36.60103	-79.49286	1. No Adverse Condition (Clear/Cloudy)	4. Icy	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
96	131985279	16. Other	PDO.Property Damage Only	7/16/2013	1500	36.60107	-79.49234	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
97	162985364	2. Angle	C.Non-visible Injury	10/23/2016	1202	36.60519	-79.48196	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	SPEED		Not ALCOHOL	
98	142265090	16. Other	B.Visible Injury	8/13/2014	1848	36.60456	-79.47833	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
99	170755215	5. Sideswipe - Opposite Direction	PDO.Property Damage Only	3/15/2017	1246	36.60148	-79.4716	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
100	151035140	5. Sideswipe - Opposite Direction	PDO.Property Damage Only	4/10/2015	2353	36.60111	-79.47076	1. No Adverse Condition (Clear/Cloudy)	2. Wet	4. Darkness - Road Lighted	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
101	152105081	9. Fixed Object - Off Road	C.Non-visible Injury	7/29/2015	557	36.60444	-79.51785	3. Fog	1. Dry	1. Dawn	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	DISTRACTED
102	170095181	9. Fixed Object - Off Road	PDO.Property Damage Only	1/7/2017	45	36.60452	-79.51774	6. Snow	3. Snowy	4. Darkness - Road Lighted	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
103	180955135	2. Angle	C.Non-visible Injury	4/4/2018	1757	36.58783	-79.43165	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
104	181175154	1. Rear End	PDO.Property Damage Only	4/26/2018	947	36.58779	-79.43156	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
105	161625158	1. Rear End	PDO.Property Damage Only	6/9/2016	1510	36.58789	-79.43146	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
106	161315244	1. Rear End	C.Non-visible Injury	5/7/2016	1809	36.58797	-79.43112	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
107	163375087	1. Rear End	C.Non-visible Injury	12/1/2016	1720	36.58792	-79.43109	1. No Adverse Condition (Clear/Cloudy)	1. Dry	4. Darkness - Road Lighted	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
108	173385168	1. Rear End	PDO.Property Damage Only	11/30/2017	1430	36.58802	-79.431	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	DISTRACTED
109	142325084	1. Rear End	PDO.Property Damage Only	8/19/2014	1519	36.58799	-79.43103	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	SPEED		Not ALCOHOL	
110	161595328	1. Rear End	C.Non-visible Injury	6/6/2016	1604	36.58825	-79.42993	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
111	142935116	1. Rear End	PDO.Property Damage Only	10/17/2014	1745	36.58836	-79.42885	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
112	160485174	1. Rear End	PDO.Property Damage Only	2/13/2016	905	36.58827	-79.42849	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
113	172095084	1. Rear End	PDO.Property Damage Only	7/27/2017	1227	36.58772	-79.42651	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
114	132465138	3. Head On	B.Visible Injury	8/31/2013	637	36.58769	-79.42639	1. No Adverse Condition (Clear/Cloudy)	1. Dry	4. Darkness - Road Lighted	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
115	152155074	1. Rear End	C.Non-visible Injury	7/30/2015	1437	36.58758	-79.42605	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
116	132385125	4. Sideswipe - Same Direction	C.Non-visible Injury	8/24/2013	2235	36.58745	-79.42584	1. No Adverse Condition (Clear/Cloudy)	1. Dry	4. Darkness - Road Lighted	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
117	151525121	4. Sideswipe - Same Direction	PDO.Property Damage Only	5/29/2015	1730	36.58748	-79.42584	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	DISTRACTED
118	151635096	3. Head On	A.Ambulatory Injury	6/11/2015	1740	36.58733	-79.42568	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
119	173625151	1. Rear End	PDO.Property Damage Only	12/26/2017	1425	36.58727	-79.42568	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
120	142165154	1. Rear End	C.Non-visible Injury	8/1/2014	1332	36.58698	-79.42527	5. Rain	2. Wet	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	DISTRACTED
121	172425176	1. Rear End	PDO.Property Damage Only	8/29/2017	1610	36.58681	-79.42507	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
122	133445108	2. Angle	PDO.Property Damage Only	12/8/2013	18	36.58658	-79.42471	1. No Adverse Condition (Clear/Cloudy)	1. Dry	4. Darkness - Road Lighted	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
123	143355272	2. Angle	PDO.Property Damage Only	11/30/2014	1146	36.58653	-79.42464	1. No Adverse Condition (Clear/Cloudy)	4. Icy	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
124	133165222	2. Angle	PDO.Property Damage Only	11/11/2013	1607	36.58639	-79.4245	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
125	173215231	4. Sideswipe - Same Direction	PDO.Property Damage Only	11/16/2017	1415	36.58647	-79.42457	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
126	140495125	2. Angle	PDO.Property Damage Only	2/17/2014	1602	36.58633	-79.42449	1. No Adverse Condition (Clear/Cloudy)	3. Snowy	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
127	130305125	15. Backed Into	PDO.Property Damage Only	1/29/2013	1357	36.58633	-79.42448	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
128	180665288	2. Angle	PDO.Property Damage Only	3/6/2018	1652	36.58643	-79.42453	5. Rain	2. Wet	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
129	153365227	1. Rear End	PDO.Property Damage Only	12/1/2015	1155	36.5863	-79.4243	1. No Adverse Condition (Clear/Cloudy)	2. Wet	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
130	151635091	4. Sideswipe - Same Direction	C.Non-visible Injury	6/10/2015	1443	36.58624	-79.42434	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
131	170035204	1. Rear End	PDO.Property Damage Only	1/2/2017	1428	36.58618	-79.42428	5. Rain	2. Wet	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
132	170825102	2. Angle	PDO.Property Damage Only	3/22/2017	1430	36.58614	-79.42417	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
133	180865157	2. Angle	PDO.Property Damage Only	3/26/2018	1931	36.5987	-79.46161	1. No Adverse Condition (Clear/Cloudy)	1. Dry	4. Darkness - Road Lighted	Not PED	Not BIKE	Not SPEED		ALCOHOL	DISTRACTED
134	160755145	2. Angle	PDO.Property Damage Only	3/14/2016	1211	36.59871	-79.4616	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
135	131075065	9. Fixed Object - Off Road	C.Non-visible Injury	4/16/2013	437	36.59845	-79.46049	1. No Adverse Condition (Clear/Cloudy)	1. Dry	4. Darkness - Road Lighted	Not PED	Not BIKE	SPEED		Not ALCOHOL	
136	173425580	4. Sideswipe - Same Direction	PDO.Property Damage Only	12/6/2017	1630	36.59846	-79.46007	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
137	180645298	1. Rear End	PDO.Property Damage Only	3/4/2018	1237	36.59856	-79.45975	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	



138	171085134	4. Sideswipe - Same Direction	PDO.Property Damage Only	4/16/2017	1646	36.59835	-79.45957	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	DISTRACTED
139	152155078	2. Angle	A.Ambulatory Injury	8/1/2015	1355	36.59805	-79.45848	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
140	180405148	8. Non-Collision	PDO.Property Damage Only	2/2/2018	2104	36.59676	-79.45717	1. No Adverse Condition (Clear/Cloudy)	1. Dry	4. Darkness - Road Lighted	Not PED	Not BIKE	Not SPEED		ALCOHOL	
141	172585182	16. Other	C.Non-visible Injury	9/14/2017	1100	36.59655	-79.45701	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
142	163555201	10. Deer	PDO.Property Damage Only	12/18/2016	1641	36.59568	-79.45543	1. No Adverse Condition (Clear/Cloudy)	2. Wet	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
143	162575108	1. Rear End	PDO.Property Damage Only	9/9/2016	1334	36.58751	-79.44716	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
144	150155108	1. Rear End	PDO.Property Damage Only	1/14/2015	1700	36.58751	-79.44715	1. No Adverse Condition (Clear/Cloudy)	1. Dry	3. Dusk	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
145	131845151	1. Rear End	PDO.Property Damage Only	7/2/2013	1217	36.58751	-79.44714	5. Rain	2. Wet	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
146	172725149	2. Angle	A.Ambulatory Injury	9/22/2017	1750	36.58746	-79.4471	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	DISTRACTED
147	172865179	16. Other	PDO.Property Damage Only	10/13/2017	228	36.58675	-79.44584	5. Rain	2. Wet	4. Darkness - Road Lighted	Not PED	Not BIKE	Not SPEED		ALCOHOL	
148	151175212	2. Angle	C.Non-visible Injury	4/26/2015	1403	36.58657	-79.44553	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
149	181315160	2. Angle	PDO.Property Damage Only	5/10/2018	1208	36.58587	-79.44384	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
150	140925156	10. Deer	PDO.Property Damage Only	4/1/2014	1320	36.58579	-79.44358	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
151	132045068	9. Fixed Object - Off Road	A.Ambulatory Injury	7/22/2013	1134	36.58555	-79.44293	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
152	153025118	1. Rear End	PDO.Property Damage Only	10/4/2015	1411	36.58557	-79.4427	1. No Adverse Condition (Clear/Cloudy)	2. Wet	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
153	160635127	9. Fixed Object - Off Road	PDO.Property Damage Only	3/2/2016	1930	36.58534	-79.44143	1. No Adverse Condition (Clear/Cloudy)	1. Dry	4. Darkness - Road Lighted	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	DISTRACTED
154	140065176	5. Sideswipe - Opposite Direction	C.Non-visible Injury	1/4/2014	1940	36.58534	-79.44094	1. No Adverse Condition (Clear/Cloudy)	1. Dry	4. Darkness - Road Lighted	Not PED	Not BIKE	Not SPEED		ALCOHOL	DISTRACTED
155	130355081	5. Sideswipe - Opposite Direction	C.Non-visible Injury	2/2/2013	1833	36.58533	-79.44046	1. No Adverse Condition (Clear/Cloudy)	1. Dry	4. Darkness - Road Lighted	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
156	170415143	2. Angle	C.Non-visible Injury	2/9/2017	1651	36.58538	-79.4395	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
157	172495187	2. Angle	C.Non-visible Injury	9/2/2017	1532	36.58536	-79.4395	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
158	132695055	9. Fixed Object - Off Road	PDO.Property Damage Only	9/25/2013	1544	36.58549	-79.43991	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	SPEED		Not ALCOHOL	
159	150135132	16. Other	PDO.Property Damage Only	1/12/2015	1607	36.58538	-79.43938	4. Mist	2. Wet	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
160	130955090	2. Angle	PDO.Property Damage Only	4/4/2013	1950	36.58542	-79.43911	5. Rain	2. Wet	5. Darkness - Road Not Lighted	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
161	141055061	1. Rear End	C.Non-visible Injury	4/14/2014	1120	36.58544	-79.43914	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
162	143465228	2. Angle	PDO.Property Damage Only	12/12/2014	1227	36.58539	-79.43917	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
163	180435204	3. Head On	C.Non-visible Injury	2/9/2018	1534	36.58542	-79.43911	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
164	153175294	4. Sideswipe - Same Direction	PDO.Property Damage Only	11/13/2015	1404	36.58543	-79.43888	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
165	171245121	2. Angle	A.Ambulatory Injury	5/3/2017	821	36.5855	-79.43873	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
166	151945081	1. Rear End	C.Non-visible Injury	7/10/2015	1930	36.58546	-79.43862	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
167	171575180	1. Rear End	B.Visible Injury	6/3/2017	1514	36.58553	-79.43829	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
168	131865073	1. Rear End	C.Non-visible Injury	7/3/2013	1318	36.58551	-79.43828	5. Rain	2. Wet	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	DISTRACTED
169	160195192	1. Rear End	PDO.Property Damage Only	1/18/2016	1657	36.58573	-79.43741	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
170	151615113	16. Other	A.Ambulatory Injury	6/7/2015	2113	36.58582	-79.43729	1. No Adverse Condition (Clear/Cloudy)	1. Dry	4. Darkness - Road Lighted	Not PED	Not BIKE	Not SPEED		ALCOHOL	
171	142795057	2. Angle	C.Non-visible Injury	10/3/2014	1949	36.58578	-79.43709	1. No Adverse Condition (Clear/Cloudy)	2. Wet	5. Darkness - Road Not Lighted	Not PED	Not BIKE	SPEED		Not ALCOHOL	
172	133095118	1. Rear End	C.Non-visible Injury	11/3/2013	1646	36.58589	-79.43694	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
173	171285505	9. Fixed Object - Off Road	A.Ambulatory Injury	5/6/2017	2320	36.58593	-79.43702	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	SPEED	UNBELTED	Not ALCOHOL	
174	132875120	10. Deer	PDO.Property Damage Only	10/11/2013	1220	36.58612	-79.43634	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
175	163135646	2. Angle	C.Non-visible Injury	11/7/2016	1007	36.60161	-79.49083	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	DISTRACTED
176	150615298	9. Fixed Object - Off Road	A.Ambulatory Injury	3/2/2015	35	36.60225	-79.48902	1. No Adverse Condition (Clear/Cloudy)	1. Dry	4. Darkness - Road Lighted	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
177	172025195	2. Angle	PDO.Property Damage Only	7/20/2017	1500	36.60299	-79.48736	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
178	163445238	9. Fixed Object - Off Road	PDO.Property Damage Only	12/9/2016	321	36.60366	-79.48639	1. No Adverse Condition (Clear/Cloudy)	1. Dry	4. Darkness - Road Lighted	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
179	162875249	12. Ped	A.Ambulatory Injury	10/13/2016	722	36.60365	-79.48619	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	PED	Not BIKE	Not SPEED		Not ALCOHOL	
180	131145126	2. Angle	C.Non-visible Injury	4/19/2013	1705	36.60501	-79.48355	5. Rain	2. Wet	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	DISTRACTED
181	130155252	10. Deer	PDO.Property Damage Only	1/12/2013	2340	36.60505	-79.48337	3. Fog	1. Dry	4. Darkness - Road Lighted	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
182	150975270	2. Angle	C.Non-visible Injury	4/6/2015	1734	36.60513	-79.48314	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
183	181455116	3. Head On	A.Ambulatory Injury	5/23/2018	1806	36.60513	-79.48304	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
184	172265202	2. Angle	A.Ambulatory Injury	8/13/2017	1547	36.60497	-79.51296	1. No Adverse Condition (Clear/Cloudy)	1. Dry	2. Daylight	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	
185	180465132	16. Other	PDO.Property Damage Only	2/14/2018	2258	36.60488	-79.51098	5. Rain	2. Wet	4. Darkness - Road Lighted	Not PED	Not BIKE	Not SPEED		Not ALCOHOL	



ATTACHMENT E: RENDERING OF BUFFERED ON-STREET BICYCLE LANES

